The

Electrical Review

VOL. XCVII. DECEMBER 11, 1925. No. 2,507.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E. A.M.Inst.C.E. *Commercial Editor:* A. H. BRIDGE.

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Telegraphic Address: "AGEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 7072 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £2 1s. 6d. per annum Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

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The All-Electric House.

THE Institution of Electrical Engineers is to be congratulated upon the paper which was presented to it by Dr. S. Parker Smith on Thursday last week. That the subject was of general interest was attested by the large attendance of members, and the only regrettable circumstance was the curtailment of the discussion, which promised to be more than ordinarily instructive. It is a long time since an I.E.E. discussion was adjourned, or since any complaint was raised to the effect that it was too brief, but on this occasion that opinion has been expressed to us not only privately but also by way of our "Correspondence" columns. It is an old-standing difficulty—shall the Elder Brothers of the fraternity dine first and meet at 8 o'clock, or meet at 6 and dine at 8? That the latter alternative is less objectionable to the majority of the members who attend the meetings seems clear, for the Council took an informal vote on the matter by postcard some years ago, and did not subsequently change the hour from 6 o'clock. It is significant of the feeling amongst the Younger Brothers that at the Informal Meetings, which commence at 7 o'clock, the discussion goes on till half-past nine, suggesting that the members concerned think less about dinner than about the debate.

It is seldom that so good a paper is submitted, and therefore all the more regrettable that it was not fully discussed. Readers of it may demur to its contents on the grounds that the electrical equipment of the house was super-normal, that the admirable tariff of the Glasgow Corporation is not paralleled in many towns, and that the capital outlay was not stated. But the data are given in full and can be made the basis of deductions with regard to differing conditions, and we trust that Dr. Parker Smith will give further particulars about the cost of his installation. Incidentally, it was interesting to note that he used cab-tire-sheathed cable throughout.

It is true that the author treats the all-electric house as a whole, and including the cost of the extra wiring and the electrical apparatus permanently installed, estimates that the total cost of the house was 3 or 4 per cent. more than that of a house equipped with ordinary coal and gas appliances and electricity for lighting only. So far as a new house is concerned, this is a per-

fectly sound basis of comparison, for when one is building a house, one does not take out the cost of the gas-piping and electric wiring separately—they are integral parts of the house, like the water-pipes. Moreover, as he points out, and as the Electrical Development Association proved long ago, a house designed for electric heating can be built and equipped with the necessary apparatus more cheaply than one designed for coal fires. This is a fact which ought to be effectively impressed upon builders and architects, especially in areas where electricity is available on a reasonable tariff. But if someone would furnish reliable data for the cost of fitting an existing house with electric heating and cooking equipment, using alternative systems of wiring, the information would be useful to many people.

As an example of thoroughness in the adoption of electrical methods, the paper is unique, for the author does not merely use all manner of electrical appliances—he has studied them in detail and puts forward a standard of efficient practice which deserves close study. The installation of separate meters for the different services afforded a means of obtaining valuable information regarding the consumption; it will be seen that heating, including water heating, accounted for four-fifths of the total consumption, and three-quarters of the total cost.

It would appear, therefore, that complete electrical heating is commercially practicable only where a very favourable tariff is offered, as the author clearly implied in his remarks at the Institution. It is true that he stated that the total cost was practically the same as he had experienced in a similar house using coal, gas, and electricity, with less return for the outlay; true, too, as he says, that few householders really know what they are paying for lighting and heating by gas and coal, to say nothing of the consequential expense for labour, redecoration, &c., and we may add that the adoption of electrical methods generally implies the simultaneous adoption of a much higher standard of lighting and heating, though the user may not be fully conscious of the fact. But it is clear that electrical men will do well to restrain their enthusiasm when advising new consumers, particularly with regard to the continuous heating of rooms and water heating, lest they create too optimistic an impression in the first instance which will be rudely dispelled by the heating bills.

The North Wales Dam Accident.

THE report of the inquest on the victims of the wash-out at Lake Eigiau, which we print elsewhere in this issue, leaves little doubt as to the facts of this lamentable occurrence. The concrete wall of the dam was founded on clay, into which it should have been carried to a depth of 6 feet; but at the part where the water broke through beneath the wall, the trench was probably only 1½ feet deep. During the past summer, which was exceptionally dry, the clay was exposed and may have been partially dried and fissured, permitting the returning water to percolate beneath the wall. The head of water was not great, and had the dam been carried down to the specified depth it might well have stood for a century; the concrete was admittedly of poor quality, permitting leaks which necessitated repeated attention, but these had nothing to do with the failure of the foundation, and the fact that the wall over the breach, 60 ft. in length, stood without support for many days before it collapsed suggests that it was of ample strength for the purpose.

The responsibility, then, rests primarily upon the head of the official whose duty it was to see that the plans were duly carried out—believed to be a Mr. Wilson, who is now dead—and secondarily upon the consulting engineers who supervised the work. But most unfortunately it happened that when the section of the dam where the failure occurred was built, the work was stopped, and remained suspended for two years; that section was neither certified nor paid for, and when the work was resumed from the point where the original contractors had left off, another firm of engineers was in charge of it.

It appears that the circumstances were altogether exceptional, and it is unlikely that any similar instance will ever be met with. The jury recommended that dams should be made subject to Government inspection, but whether the defect in the Eigiau dam would have been discovered by this means is very doubtful. As a rule, the engineers in charge of such work, having their reputations at stake, may be trusted to take every possible precaution to ensure the safety of the structure, and we cannot doubt that if the work on the Eigiau dam had followed the normal course the faulty section would have been detected and rebuilt at the time. The moral of the accident seems to be that continual inspection by an expert supervisor is indispensable.

While we doubt the efficacy of Government inspection during construction, there is much to be said in favour of an official inquiry in case of failure, such as those held by the Board of Trade in connection with boiler explosions and railway accidents, and it is probable that the question of instituting machinery for the purpose will be seriously considered.

Modern Electric Cookers.

IN following closely the developments which are being introduced into the design and construction of electric cookers, an article on which has been appearing in our columns and is concluded in this issue, it appears to us that the greater part of the attention of the manufacturers is being directed to the demand of the supply engineer for apparatus calling for less maintenance than has been the case in the past, and in which repairs may be effected with a minimum of time spent on the consumer's premises; these requirements refer almost entirely to the hob plate elements.

To meet the first need, the enclosed boiling plate is being advocated, and it is generally assumed that by adding to the protection of the elements in this manner, the efficiency of the plate from the point of view of energy consumption is appreciably reduced. It would be interesting to know exactly how far the user gains or loses in the overall efficiency; few data are available, and it seems that the whole question is still in the "matter of opinion" stage. We hope that it will soon be possible to lay down definitely how far protection may be given to the elements without the overall efficiency of the cooker suffering in consequence. The figures given by Dr. Parker Smith in his I.E.E. paper for the efficiency of boiling rings were rather startling, and call for explanation.

With regard to the consideration of effecting repairs on the premises, there is a tendency to construct the elements in unit form so that the whole may be replaced "on the spot," and the defect repaired in the workshop. It is noticeable that in some designs this practice results in the actual elements being inaccessible. We think that the ideal unit would be an interchangeable one, in which the element spirals or bars and the connections were easy to examine and replace.

Germany and International Co-operation.

A GOOD deal of hard thinking is taking place in Germany regarding the future of international trading. What is more natural, considering the need of capital and all the consequences thereby entailed? But while hard thinking as the outcome of anxiety is to be expected, it is unaccompanied by boastful bombast heralding schemes for world expansion such as we heard so often in the old days, and will not be objected to by the most suspecting Britisher. Yet the situation as it develops will require careful attention.

At the annual conference of the Central Verband der Elektrotechnischen Industrie last month, in Berlin, Dr. Carl Fr. von Siemens, the president, portrayed the economic future in very gloomy colours, and a later speaker, a former Minister of the Reich, indicated combination of works producing the same classes of articles as the direction in which salvation lay. It is anticipated, for example, that if the big Westphalian iron and steel trust becomes effective there will be, with an output of 6,000,000 tons of steel, an economy of £2,000,000 in the cost of keeping stocks. This, however, indicates no

material departure from the procedure which used to be characteristic of German organisation; it is periodically examined and advocated here with special reference to particular lines of electrical manufacture, and it has been practised on a small scale by British firms.

But the discussion at the Central Union went further than to deal with internal re-organisation; it included the subject of international economic co-operation. Dr. Meinhardt, of the Osram Company, prepared his hearers by remarking that new times required new ways, such as a combination extending beyond the German frontiers. While German electrical exports were not unfavourable, this section of outside trade was not doing well when compared with the pre-war period, and what it desired was to secure its share in the requirements of the world. International understanding had been the aim of the electric lamp makers, and he found everywhere abroad a disposition for international co-operation, in which the lamp agreement of 1924 had shown the way to other industries. Dr. Meinhardt went on to say that price-fixing for the world did not form part of that agreement, the organisation in each country being left to regulate prices for itself. The lamp combination allowed them to hope that in a short time that branch of industry would be able to substitute a serviceable and uniform pattern for the confused mass of types and sizes. The experience of a year's working of the agreement had been that the German factories were able to supply their customers at prices which were less than 70 per cent. of the pre-war price.

We may quote one other speaker—Herr Deutsch, of the A.E.G., who likewise advocated a horizontal construction of German industry. He was not in favour of syndicates which would have a price-increasing effect, but he desired to see a complete combination of similar kinds of works in a new company. In the first place, the combination should be of a German national character; secondly, it should be extended so as to be of European scope; and, thirdly, become international by the inclusion of the United States, thus bringing in the world markets. When such a stage had been reached it would not be possible to set aside the next problem of the question of the United States of Europe, which would be regulated both politically and economically. Herr Dutsch finally went so far as to express the opinion that the question of horizontal combination with the abolition of Customs duties and the creation of the United States of Europe, would come into prominence in the next ten years.

The Internal Combustion Boiler.

THE mystery of Mr. Oscar Brunler's boiler efficiency is not in any way elucidated by his recent paper before the Institute of Marine Engineers. This boiler, as our readers will remember, consists of a vessel in which steam is generated by a flame burning in actual contact with the water. Oil is used as fuel, and the air for combustion has, of course, to be supplied to the flame at a pressure somewhat higher than the steam pressure in the boiler. The products of combustion and the steam generated leave the boiler as a mixture of which slightly less than half is steam, the remainder being incondensable gases. So far as the utilisation of this steam-gas mixture is concerned, the inventor appears to realise that any engine or turbine employed would have to exhaust at atmospheric pressure because of the practical impossibility of maintaining a vacuum, but this fact is regarded as of minor importance. Practical considerations, however, may be neglected for the moment in view of Mr. Brunler's reiterated claim for net efficiencies of over 100 per cent. for his apparatus. He gives "data" of tests which have been carried out during the past months by different authorities," purporting to show an efficieney of 109 per cent. with an unlagged boiler, but does not give the names of the "authorities" who arrived at so remarkable a result. He "could add a series of test figures showing efficiencies from 95 per cent. to 120 per cent.," and his faith in such figures is shown by his statement that "when facts and theories clash it is best to discard theory." With this pronouncement we cordially agree, but we would suggest that before discarding theory, Mr. Brunler should make allowance for the power absorbed in compressing the whole of the combustion air to 120 lb. per sq. in. before forcing it into the boiler, a little point which seems to have been overlooked, in the case of the test quoted.

Until we have a test of the boiler carried out by some authority whose name will inspire confidence, it is useless to follow Mr. Brunler into his theories as to how efficiencies of more than 100 per cent. can be explained. We can only agree that "time and science which never stand still will bring the solution of this phenomenon," though we think the solution, when found, will turn out to be something much more prosaic than Mr. Brunler anticipates. The boiler, however, has other properties almost as remarkable as its efficiency. "Only a few weeks ago," the paper states, "we ran boiler trials with feed-water which was mixed with 150 lb. of lime per ton of water, and after more than a week's run the boiler was inspected and the plates were perfectly clean and free from any incrustation." It would appear, from other portions of the paper, that this boiler was 3 ft. in diameter by 4 ft. 8 in. high, with a maximum capacity of 11,000 lb. of steam-gas mixture per hour. Supposing the boiler to have been worked for only 50 hours during the week, at an average steaming rate of only 3,000 lb. of steam per hour, the 150,000 lb. of feed-water would carry nearly 4½ tons of lime into the interior. One would have thought that this would have been enough to make a perceptible deposit in so tiny a boiler, but where the lime went is one of the mysteries which we must leave "time and science" to explain. The blow-down cocks may have been working overtime.

Electricity Supply in Rural Areas.

THE fifth annual report of the Electricity Commissioners confirms our own frequently-expressed opinion with regard to "the demand which has been shown to exist" in rural areas. The words quoted above are derived from paragraph 19, page 10, of the Report. The North Somerset Electric Supply Co., Ltd., appears to share this view, and is giving practical effect to it, for Parliament last week confirmed the North Somerset Electricity (Extension) Special Order, 1925. The company therefore now holds statutory powers over the following areas*:—The City of Wells; the Borough of Glastonbury; the Urban Districts of Clevedon, Highbridge, Midsomer Norton, Portishead, Radstock, and Shepton Mallet; the Rural Districts of Axbridge, Clutton, Long Ashton, and Wells (except three parishes); twelve parishes in Shepton Mallet, R.D., six in Frome R.D., one in Bath R.D., and one in Keynsham R.D.

We understand that the scheme of distribution for this area, which includes approximately 450 square miles (288,000 acres), will cost well over a quarter of a million sterling, and we congratulate the company on its not adopting the "wait and see" policy. We should like to see other undertakers quoting their statutory areas (for general supplies) in acres or square miles. It is to be regretted that this information was not included in the Electricity Commissioners' Return of Electricity Supply Undertakings. It is very instructive to compare the extent of operations in different parts of the country, and by means of acreage one can obtain a fairly good idea of the relative sizes of territory. For instance, it is easily found without the aid of a map that the territory of the North Somerset Electric Supply Co., Ltd., is more than one quarter of the whole county, and indeed it covers more than one quarter of the area of the East Midlands Electricity District.

The engineering proposals of the company are based upon the taking of a bulk supply from the Corporation of Bristol, and embody a general scheme of rural development for the supply of electricity over a large area to a number of small towns and villages.

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*See map on page 925.

Electricity Supply in Great Britain.—VII.*

Dorset and Somerset.

STATUTORY powers for the supply of electricity have either been granted or applied for in respect of the hatched areas on the maps here reproduced.

A large portion of Somerset is included in the Lower Severn Electricity District as provisionally determined by the Electricity Commissioners, but Dorset does not yet form part of an Electricity District.

In the list of authorised undertakers given below (whose areas of supply are wholly or partly in either Dorset or Somerset) it will be seen that there are no Power Companies.

Local Authorities.

Bath Corporation.
Bristol Corporation.
Dorchester Corporation.
Lyme Regis Corporation.
Taunton Corporation.
Weymouth Corporation.

The Shepton Mallet Gas Company (Electric Lighting) Act, 1905, was revoked in July, 1924, in so far as it relates to the supply of electricity, but the area concerned remains hatched as it was immediately applied for by the North Somerset Electric Supply Company, Ltd., whose Special Order has now been confirmed.

The 1921 Census gives the following particulars for the Administrative Counties of Dorset and Somerset and the associated County Borough:—

Acres.	Persons.	Resident families.	Buildings not containing dwellings.
1,663,206	693,870	166,568	11,479

These maps were prepared for the 1917 Boundary Commission, and are used here by permission of the Controller of H.M. Stationery Office. They are obtainable from Messrs. Edward Stanford, Ltd., price 6d. The following alterations have taken place since 1917:—

(1) The name of the Parish of Road is now spelled Rode.
(2) The Urban District of Burnham has been re-named Burnham-on-Sea.

Electricity Supply in the County of Dorset.

Companies.

Blandford Forum & District Electy. Supply Co., Ltd.
Bournemouth and Poole Electricity Supply Co., Ltd.
Bridgwater Dist. Elec. Supply & Traction Co., Ltd.
Burnham and District Electric Supply Co., Ltd.
Edmundson's Electricity Corporation, Ltd.
Mid-Somerset Electric Supply Co., Ltd.
Minehead Electric Supply Co., Ltd.
North Somerset Electric Supply Co., Ltd.
Sherborne Electric Supply Co., Ltd.
Swanage Gas and Electricity Co.
Wareham Electric Supply Co., Ltd.
Weston-super-Mare & District Elec. Supply Co., Ltd.
Yeovil Electric Light and Power Co., Ltd.

(3) The Parish of Melcombe Regis has been merged into the Parish of Weymouth, which is now co-extensive with the Borough of Weymouth.

(4) Part of the Parish of Easton-in-Gordano has been added to the County Borough and Parish of Bristol.

(5) Part of the Parish of Colehill has been added to the Urban District and Parish of Wimborne Minster.

(6) The Parish of Alcester and part of the Parish of Cann have been added to the Borough and Parish of Shaftesbury.

(7) Parts of the Parishes of Bishop's Hull Without, St. James Without, St. Mary Magdalen Without, Trull, and West Monkton have been added to the Borough of Taunton. The added parts have been amalgamated with the Parishes of Bishop's Hull Within, St. James Within, St. Mary Magdalen Within, and Wilton to form the Parish of Taunton, co-extensive with the Borough.

(8) Part of the Parish of Symondsbury has been added to the Borough and Parish of Bridport.

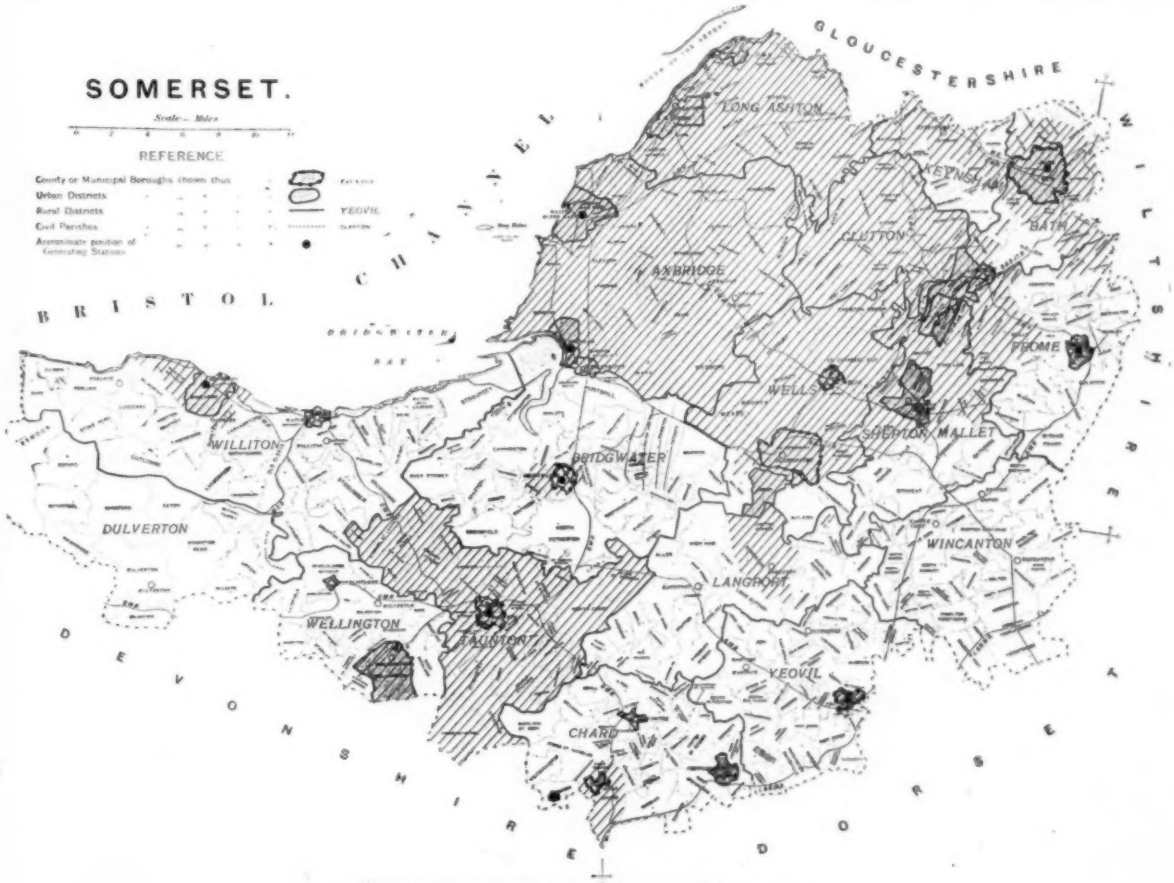
* Parts I-VI of this series appeared in the ELECTRICAL REVIEW of October 9th, 16th, 23rd, and 30th, and November 13th and 20th, 1925.

Electrical Progress in India.

Lines of Future Development.

(By An INDIAN ELECTRICAL ENGINEER.)

IT is a characteristic of India, in common with other Eastern countries, that it offers ample scope for the modern to flourish side by side with all that stands for the ancient. On the roads the Rolls-Royce flits past the palanquin; in the home the electric lamp outshines, but has not ousted, the old-time oil lamp. Thus we find, in a country industrially one of the most backward, a remarkable development in certain branches of electrical engineering. When completed in the early part of this century, the Sivasamudram (Mysore) hydro-electric scheme ranked as the biggest venture of the kind in the British Empire. It was the more remarkable in view of the fact that the supply was transmitted over a distance of 92 miles to Kolar Gold Fields. At the present time the biggest hydro-electric project ever handled by a British firm is the one for the Bhira station of the Tata Power Co. The plant consists of five sets, each consisting of twin Pelton wheels of 15,000 h.p., driving an 11,000-V, 21,900-kVA alternator.



Electricity Supply in the County of Somerset (*See p. 924*).

The Hydro-Electric Possibilities.

The hydro-electric resources of the country were systematically explored by Mr. J. W. Meares, M.I.E.E., and his Commission, the report of which is well known to electrical engineers in this country. As is pointed out in this report, it is regrettable that the sources of hydro-electric power are in many cases located far from centres of industry. Hence development of this power must be slow unless the Government of India adopts the bold policy of making energy available in anticipation of demand. While there are grave risks attached to such a course, it is well known that in India, as in other places, the availability of cheap electric power not only fosters old industries, but often gives rise to new ones. A case in point is that of the Sivasamudram scheme, which in its initial stages depended entirely upon the Kolar Gold Fields for its load, but now supplies the greater part of its output to other industries, some of them entirely new, in Bangalore and Mysore. The case of Bombay is somewhat similar, *mutatis mutandis*, to that of Bangalore, it being generally agreed that the cotton industry there has been revolutionised by the advent of hydro-electric power supply. The first Tata hydro-electric scheme was completed in 1912; it was followed by the Andhra Valley and other Tata power schemes, the aggregate power available amounting to about a quarter of a million kW. Combined with cheap labour, the new source of power supply has been an important factor in the competition that the mills of Bombay are offering to those of Lancashire.

A number of schemes are in course of development in various parts of India at the present time. In the Western Ghats, near Bombay, as well as further south in Malabar and Cochin, surveyors are busy. Mysore is turning her attention to the harnessing of the famous 1,000-ft. Gersoppa Falls with a view to utilising them for electro-metallurgical and other purposes. In North India, the Punjab is the centre of interest from the point of view of hydro-electric resources.

Electric Traction Developments.

The Great Indian Peninsula Railway, admittedly one of the most efficient lines in the country, gave the lead in the matter of electrification. The first stage, now nearing completion, is mainly intended for urban service. A much larger scheme, involving the electrifi-

cation of 300 miles of main line, is now under consideration. The B.B. and C.I. Railway, another of the lines converging into Bombay, has electrification plans in view, while many other railways, notably the B.N. Railway and the S.I. Railway, in Bengal and Madras respectively, have ambitious schemes of their own. As regards the tramways, in many of the greater towns only the question of finance stands in the way of carrying out urgently-needed extensions. The tramway has also a great scope in the moderate-sized towns, of which so many are still without any organised public conveyance service. In certain congested areas of Bombay and Calcutta there would appear to be some scope for the railless electric 'bus in view of its greater flexibility. Progress in the application of electric battery trucks is very encouraging, particularly at harbours and railway termini.

Power Supply in Small Towns.

A field in which great possibilities exist is that of electricity supply in the smaller towns both for lighting and power purposes. In view of the fact that the development of hydro-electric power all over India must take a considerable period, and that many of these towns are even now ready to become consumers of electric power, it is clear that the small generating plant has ample scope in India. There are, of course, some obstacles to be overcome, such as the conservatism of the people and the ignorance of local authorities with regard to electrical matters. But there is consolation in the fact that there is no well-established competitor like a heavily-capitalised gas industry to impede the progress of electrical development.

Small industries connected with agricultural products, such as oil and rice mills, and tea- and coffee-curing works, are a feature of the economic life of India. There has been no serious attempt made as yet to introduce electricity into these, which, be it noted, are scattered over the country often at great distances from the large cities. The advent of electricity in the small town will bring electricity supply nearer to these industries. The problem is very complex and beset with many difficulties, but, if successfully tackled, would yield much fruit. With regard to the demand for electricity for such domestic uses as cooking, heating, &c., there is not anything like the scope which exists in Western countries. The principal consumers would be the large hotels and the more up-to-date bakeries, and these would by themselves constitute a class worthy of consideration.

A Few Remarks on Selling.

By "SALES MANAGER."

MUCH has recently been written on the question of selling, and naturally it is a question of such magnitude that it would be impossible to treat the subject fully in a short article of this description. I propose, however to deal generally with the question on the lines of a salesman's worth, and methods generally adopted in connection with sales, not from the point of view of selling over the counter, but more especially in connection with plant.

Before proceeding on the lines mentioned above, I would draw the reader's attention to an article appearing in this journal on November 20th, headed "When Salesmen Sell the Business," from which the writer appeared to imply that a sales organisation from the sales manager down, simply thought of nothing else but turnover at any cost, having no regard to the balance-sheet, whereas I can assure "Cost Consultant" that the selling organisation, although realising that a turnover must be obtained, also realises that the turnover must show a profit; if it does not, then there will soon be a new selling staff, or at least a new sales manager.

From a broad aspect, and to suit the purpose of this article, I will divide a manufacturing business into two departments, referring to them as production and selling, as it would take far too much space to deal with all the various departments which are necessary in a concern to keep production and selling functioning in an efficient manner. In any case I think it will be agreed that there are two essentials in a manufacturing concern, *viz.*, to produce the article and to sell it.

At this point there are two further aspects to be taken into consideration: (1) Is there a market for which we have to find an article? or (2) Is there an article for which we have to find a market? Probably if we went back many, many years, we might say to the commencement of selling, then we should have to admit that it was in practically all cases a question of creating the market, but to-day we must consider both aspects, although it is difficult to draw an actual dividing line. As an example, I would quote that there is a market for electric lamps, irons, transformers, &c., and the articles are being produced—on the other hand, when a turbine was first produced, there was no market for it, for the simple reason that the reciprocating engine had been more or less perfected, whereas the turbine was far from perfection. Probably at some period all things could be treated on the same level, *viz.*, from the point of view of creating the market, but I have taken these two cases to show that the salesman who has to create his market must possess a far greater imagination and be a far better salesman than the man who has his market already made for him, for, in the first case, the man has to see the possibilities of the imperfected article, which I think everyone will agree is extremely difficult. Now, where the article is perfected and the salesman simply has to sell in ordinary competition, he need not possess the same qualifications. Where one has to sell practically identical articles at the same price, which is often the case to-day, then the personality of the salesman is the chief consideration.

Viewing the question from these two points, I think everyone will agree that where one has to create the market and sell, as against purely selling, then the former is by far the more difficult problem; consequently any man possessing the qualifications, or I think I might say gift of being able to create the market, and also to sell at a profit, is worth far, far more than the salesman who merely sells a standard article in competition.

I do not wish to imply that it is an easy matter to sell a standard article in competition, as I know from experience it is a difficult matter, but simply to point out that the man who can create the market and sell at a profit is not only of tremendous value to a concern, but is surely a super-salesman.

Passing to the question of methods generally adopted in connection with sales, we all realise, of course, that the percentage of importance of production and selling is "fifty-fifty." It is, therefore, essential for the efficient working of a concern that the general manager be absolutely unbiased, for if he is 70 per cent. production and 30 per cent. sales, or *vice versa*, then the concern must suffer. Some of us may wonder why a general manager's salary is so much more than that of the sales manager or the works manager, but if we consider the matter for a moment, the answer is obvious, for, to be a successful general manager, the qualifica-

tions of works and sales manager must be combined fifty-fifty. "Cost Consultant" recently referred in these columns to the question of final price-fixing being left, more or less, to the sales manager, irrespective of profit or loss. If final price-fixing is left to the sales manager, then the concern is asking for trouble, for it is obvious from previous statements that final price fixing is purely a matter for the general manager (or someone representing him), not for the man responsible for production or selling—otherwise the production man would simply say at the end of the year, if the balance-sheet showed a loss: "Sell at higher prices," whereas the selling man would say: "Produce at less cost," and where would the general manager be when called upon by the board to give an explanation? Would it not be a question of the resignation of the general manger, for the simple reason that he was obviously incapable of holding the position, if the foregoing situation arose?

Now we come to the correct method of deciding prices, and as we are reckoning that we have to create the market, we have little or no guidance as to selling price—the main responsibility again devolves on the general manager, and he must be satisfied that the article is being produced at the best possible figure; he has, of course, all costs tabulated as regards works, overhead, &c.; then he gathers from the sales manager the probable cost of this department, and arrives at the selling price. By this means, if normal profit is not being made, assuming the turnover is being maintained, it is up to the general manager to decide as to whether the production costs are too high, or the selling prices too low, and then take the necessary action to correct the conditions which exist.

Where the market already exists, prices are more or less established, the bulk of the orders going to the concern with the best selling organisation. It has been said that we are a nation of shopkeepers; perhaps we are, but then most things revolve round buying and selling.

Modern Electric Cookers.

A Review of the Recent Improvements in Electric Cooking Stoves.

(*Concluded from page* 846.)

An unusual method of housing the oven elements has been adopted by the General Electric Co., Ltd., in its recent production, the H5670 model, fig. 16. As in other designs of cookers by this firm, the elements are arranged for heating from the sides. They are made up in unit form in a rectangular frame, which is lowered vertically into a chamber between the shell and the lining at each side of the oven. The top of the frame or element unit is accessible after the hinged hob plate is lifted, and consists of a flat plate, which acts as a terminal board and secures

Fig. 16.—"Drop-in" Oven Elements.

the frame in the chamber. Fireclay bars, on which the nichrome element spirals are wound, are placed horizontally across the lower end of the frame, and rigid bar connections are employed from these to the terminals. The bars are easily removable from the frame, out of position, by releasing two bolts and wing nuts on each. The overall dimensions of this cooker are 25½ in. by 18½ in. by 15½ in. In another G.E.C. model, H5700, the element bars are attached to fixed rigid connecting rods. The oven, boiling and grilling-plate elements are separately fused and controlled. The clear oven cooking space is 14 in. high, 16 in. wide, and 16 in. deep. The full oven consumption is 2,400 W and the total loading for the stove is 8,000 W.

While it seems to be the general practice to install top and bottom oven elements with unequal loadings, it is interesting to learn that in the latest "Cosmos" cooker the makers have provided similar elements with equal capacities, having concluded from experiments and trials that it is unnecessary to have different heat values at the two parts. If this claim can be substantiated, a considerable advantage is gained by the fact that the two elements are interchangeable, a desired feature from the point of view of production and maintenance. Fig. 17 illustrates the bottom elements of the

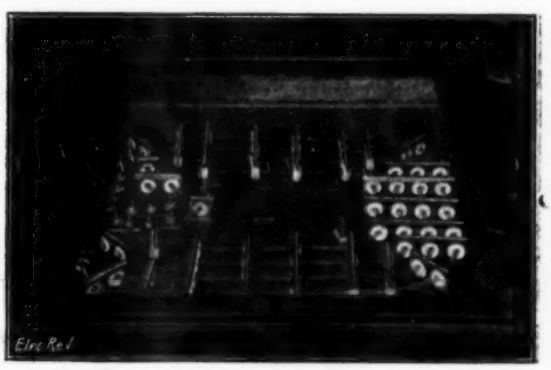


Fig. 17.—Bottom Oven Elements.

"Cosmos" cooker. The oven linings are easily removable to facilitate the effecting of repairs and replacements. This cooking apparatus is provided with an ample-sized hot cupboard placed between the oven top and the hob.

A recent addition to the field of electric cookers is the "Revo Family" model, fig. 18, manufactured by the Cable Accessories Co., Ltd., which is designed to suit a family of up to eight people. The oven is constructed in sections welded together, and has a capacity of 1.7 cu. ft. A novel feature in this cooker is the provision of a warming chamber, 17 in. wide by 15 in. deep and 6 in. high, situated as in the previously-mentioned

cooker between the oven top and the hob plate. This should result in the inevitable waste heat from both the oven elements and the hob plate units being utilised. The top plate is hinged, and when raised exposes the wiring to the boiling and grilling plates. Solid strip

Fig. 18.—Cooker with Hot Cupboard Under Hob.

copper of heavy section is employed, supported, where necessary, by glazed porcelain insulators. The "Revotherm" boiling plate of this range is of the "semi-open" type; a heavy-gauge resistor is supported by steatite insulators, as near to the base of the

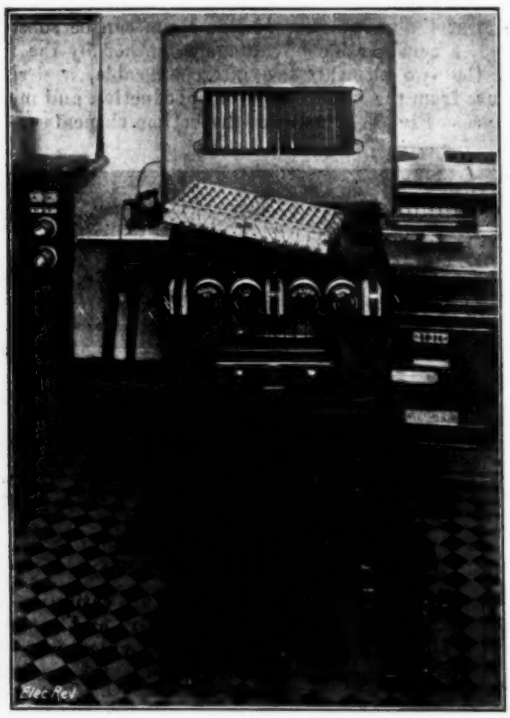


Fig. 19.—Construction of a Modern Cooker.

utensil as possible, and is permitted to radiate directly on to the latter in two directions. Immediately above each spiral is arranged a bar of the cast grid, which is of heavy section. This bar, it is claimed, effectively protects its adjacent spiral from damage by viscid liquids. Apart from the radiant heat utilised, a high percentage of heat is claimed to be conducted by causing the insulators carrying the spirals to make intimate contact with the grid casting. Each plate is carried by means of an easily-adjusted suspension system, and the removal of a plate is immediately effected by the loosening of three milled nuts. No contact is made with the top plate casting, and concentrated heating, it is claimed, is assured. The grill is constructed for three-heat regulation, low heat being available for quickly warming the hot cupboard.

The British Electric Transformer Co., Ltd. (Tricity), has recently introduced a range of three electric cookers specially designed to meet the requirements of hiring and housing schemes. The smallest of these, fig. 19, is claimed to be of particularly limited overall dimensions for a total loading of 5,000 W. Although in other models the makers have introduced either or both of the semi-enclosed and closed types of boiling plates, in this design only semi-enclosed plates are employed. Two plates are provided, one arranged with a 3-heat control and the other a single heat control. The 3-heat plate is arranged so that the medium heat is obtained in the centre of the plate. The element spirals are wound and housed on a grid-shaped fireclay base held in a light metal frame, two plates forming a

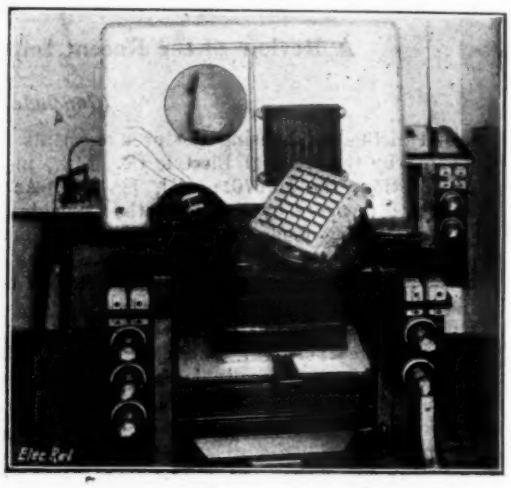


Fig. 20.—Hob with Closed and Semi-Enclosed Plates.

complete unit. The latter is held in position by means of four sockets in the base of the frame, which accommodate plugs projecting from a supporting platform underneath. The hob is hinged and provided with protecting plates arranged in grid form with the bars covering the elements. The spirals are placed so that radiant heat will reach the cooking receptacle obliquely from them. The bottom surfaces of the bars are concaved to present a maximum of area to the elements. The fireclay base is slotted to enable spilt liquids to pass through. An unusual accommodation for the grilling plate places it underneath the boiling units. It is of similar construction to the latter, except that the fireclay is not slotted, being, of course, inverted in this case. Two hooks at the back and a front screw hold it in position. The makers advocate top and bottom oven elements, and these are arranged so that they are distributed over the whole surface of the top or bottom, as the case may be, it being considered advisable to have a large element at a low temperature. These elements are built up in unit form of probably unique construction. The spirals are threaded through mica strips, suitable holes being provided with nickel eyelets. The micas are held width vertically in a sheet-metal frame which covers the surface. The oven linings are of plenished steel and the sides and top and bottom sections are all easily removable. The bottom plate is turned over at the edges, which fit suitably shaped runners, thus affording protection to the elements against spilt liquids, &c. The shelf runners consist of round metal

rod elbowed and riveted at each end. The main terminals for the cooker are at the back immediately under the hob plate, and rigid copper strip busbars are carried between the boiling and grilling plates to sub-main terminals at the front, from which nickel connecting rods are taken to the various element units. The element terminals are of pure nickel, and the sub-main terminals are nickel-plated. An interesting point about this small cooker is that the hob plate presents a dull black surface which, it is claimed, is partially

Fig. 21.—Combined Cooker and Water Heater.

rust-proof. The enclosed boiling plate adopted by this firm is constructed of mica strip-elements suitably insulated and clamped in iron frames, the whole being housed in a round metal inverted case. The plug and socket method of securing this plate is employed as in the case of the smaller model. In every cooker provision is made for a thermometer if required, the oven door being drilled and bushed. Fig. 22 illustrates the housing of one of each of the closed and semi-enclosed types of boiling plates in the intermediate cooker.

A novel departure from the standard methods of cooking by electricity in relation to the position of the elements has been adopted by Messrs. Geipel and Co. in the "Quead" cooker, which was described in our columns on August 21st, page 319. In this apparatus, it will be recalled, the source of heat is nearer the centre of the oven, and consists of two vertically-disposed elements adjustable horizontally so that they can be brought near to the meat for grilling or moved apart for roasting.

Much attention has of late been given to the question of water heating for domestic purposes, and in some directions this has been attempted in co-operation with the apparatus for ordinary electrical cooking. Such a combined cooking and water-heating apparatus is made by Messrs. Turner & Co., Ltd. A cylindrical boiler stands vertically next to the oven, and the water is heated by means of elements arranged in a central copper cylinder so that water circulation is set up. Another design of cooker incorporating water-heating equipment is made by Messrs. Archibald Low & Sons, Ltd. In this case, fig. 21, a copper tank is placed under the boiling plates and is so constructed that whenever the boiling plates are in use the water in the tank is being heated. An immersion heater is installed for quick heating. It is claimed that the effect of utilising heat from the hob plate units is to increase the overall efficiency of the cooker by 25 per cent.

The Shipping and Engineering Exhibition.

A Review of the Principal Exhibits of Electrical Interest.

(*Continued from page* 892.)

A "Shipping" Exhibition, opened by Mr. W. C. Bridgeman, First Lord of the Admiralty, would naturally be expected to have a marine atmosphere, and a pleasing feature was the demonstration of the extensive use that is now being made of electricity, not only for the purpose of driving auxiliary machinery aboard ship, but also in the building of ships themselves.

For instance, amongst the heavier machine tools shown many were arranged to be electrically driven, and it was satisfactory to note that in most cases the motor had been allowed for in the design of the standard machine, and not merely added as an extra. Such machines were to be seen on the stands of Messrs. C. A. Hunton & Son; Sumner, Vaughan & Co., Ltd.; Henry Pels; and the United Machine Tool Co., Ltd., particularly. An interesting machine made by the last-named company is an electro-mechanical toggle lever riveter having a direct motor drive, and operated in conjunction with an electric rivet heater. The smaller type of portable hand tool, such as drills, screw-drivers, grinders, riveting and chipping hammers, &c., was exhibited by F. Gilman (B.S.T.), Ltd., the Vidal Engineering Co., Black & Decker Mfg. Co., Ibbetson and Co., and the Kango Co., Ltd. S. Wolf & Co., Ltd., had electro-pneumatic patterns on view in addition, while S. H. Morden & Co., Ltd., make various attachments (for example, a miller for trimming wood) which are driven by a flexible shaft so that the tool can be used some distance away from the driving motor.

A noticeable point was the number of firms displaying electric welding plant, amongst them being the Quasi-Arc Co., Ltd.; G. D. Peters & Co., Ltd. (Wilson plastic arc and resistance systems); Allen-Liversidge, Ltd. (arc and resistance); the Consolidated Pneumatic Tool Co., Ltd. (spot, seam, tape and butt), and Alloy Welding

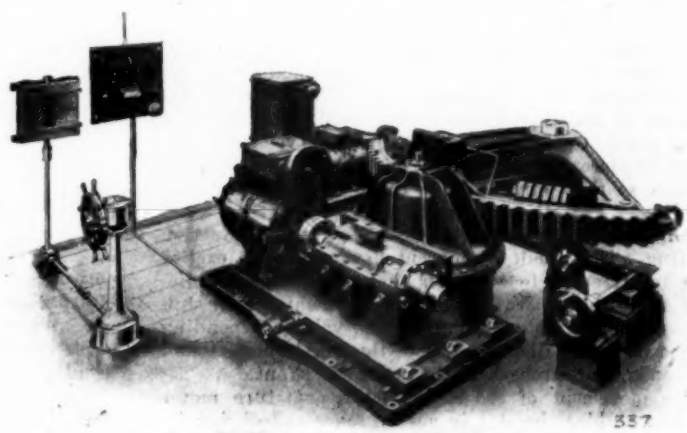


Fig. 7.—Donkin-Scott All-electric Ship's Steering Gear.

Processes, Ltd. (d.c.), which also owns the patents of the Daysohms a.c. welder.

Ships' Auxiliary Plant.

A good deal of the auxiliary plant in the engine room and of the deck machinery also is driven electrically

nowadays, especially aboard oil-engined vessels; amongst the fine display of Laurence, Scott & Co., Ltd., in addition to electric winches, gear for ships' windlass, motors and control gear, the direct-acting steering gear illustrated in fig. 7 claims an advantage in that no make or break of current takes place, operation being by the promotion and stoppage of the flow of current in permanently-closed circuits, which eliminates sparking and burnt contacts and therefore reduces renewals.

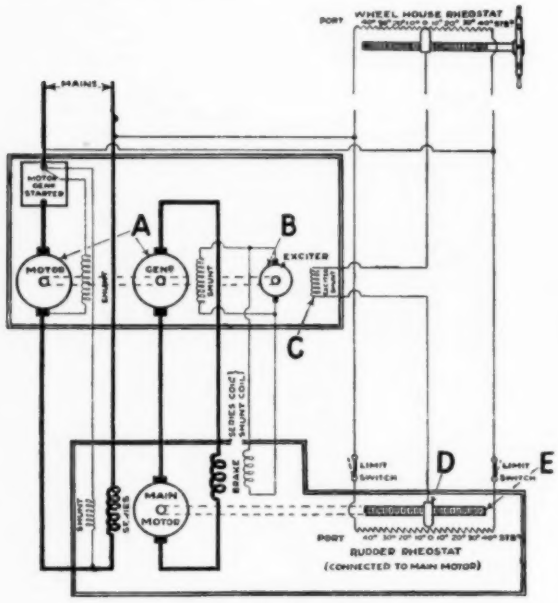


Fig. 8.—Steering Gear Diagram.

Referring to fig. 8, a motor-generator (A) takes current from the line, and runs all the time at sea. The generator supplies current at a varying voltage to the main motor connected directly to the steering gear, and to provide the varying excitation of the generator a small exciter (B) is connected on the shaft of the motor-generator, the motor end of which is started from the ship's mains by means of an automatic starter which will only open the circuit during a total failure of voltage, and automatically re-starts the motor when the voltage is restored. A drop in voltage, even to 25 per cent. of the full-load voltage, does not affect this gear, except to slow it down. The control of the steering gear is effected on the Wheatstone bridge principle, one resistance (forming two legs of the bridge) being in the wheel house, and another resistance (forming the other two legs) in the steering-engine compartment. The exciter field winding (C) takes the place of the galvanometer, and the resistance in the two rheostats is varied by a slider carried on a nut (D), which is fed backwards and forwards by a lead-screw (E). The screw of the rheostat in the wheel house is connected, generally with equal gears, to the wheel, so that any movement of the wheel displaces the slider, and thus upsets the electrical balance so that current flows through the exciter field winding. The other rheostat is mounted on the main steering gear motor, by which it is driven by reduction gearing. The result of current flowing in the exciter field (as referred to above) is that the exciter supplies current to the generator shunt; this machine then supplies the main motor armature, the voltage depending on the degree of displacement of the wheel rheostat and the consequent strength of the generator shunt.

The movement of the main motor armature moves also the rudder rheostat in such a sense as to bring its slider into coincidence with the new position of the wheel rheostat slider; by the time these two coincide, the exciter field winding has lost its current, the generator its excitation, and the main motor has lost its armature current, so that the whole system comes to rest. The voltage of the generator (and therefore the speed of the main motor) depends on the difference in position between the two sliders, so that for large degrees of helm the movement starts quickly, but tends to ease down gently as coincidence is nearly reached. Though the main motor thus slows down towards the end of its travel, it does not consequently lose its torque, as the generator can supply a big current at low voltage for completing the movement. When the wheel-house rheostat is hard over, the rudder rheostat still has a little way it can go, supposing that the rudder is being driven further over by the sea. The effect of a step or so over-run in this manner is to reverse the current in the exciter field winding, and therefore to bring the main motor back again to the same angle indicated by the wheel. As an additional precaution, limit switches are provided. The mechanical portion of this gear is made by Messrs. Donkin & Co., Ltd.

A crane motor fitted with the Scott "floating-brake" system of control for series-wound machines is shown in fig. 9, being a combined electro-magnetic and mechanical system. The brake is controlled by a small shunt winding, only used for full lifting and lowering, and a heavy series winding which (when energised) attracts the steel armature against the pressure of suitable springs, thus releasing the brake. The "floating" or low-speed steps of the controller, with the starting resistance in circuit, divert current from the series winding of the brake to such a degree that the pressure of the springs begins to overcome the opposing magnetic force and puts the brake partially on. In this condition the brake is "floating," the speed of the motor depending on the amount of current diverted from the series winding of the brake. The floating action on any braking step of the controller is nearly independent of the amount of load lowered, and is self-corrective, so much so that the braking surfaces can be treated with plumbago so as to diminish the co-efficient of friction without appreciably increasing the speed-control effect of the brake. The action is automatic and steady, for if the friction of the brake increases, the current taken by the motor and brake coil also increases, slightly easing the brake. If the friction decreases, the current in the brake coil decreases, and the braking action automatically increases.

Electric deck gear was also to be seen on the stands of the Sunderland Forge & Engineering Co., Ltd., and A. Harper, Sons & Bean, Ltd., and several firms showed air compressors and blowers suitable for ships' use. Oil filters and purifiers were well represented, five different

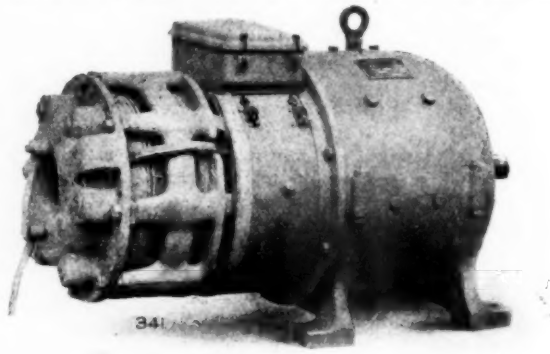


Fig. 9.—Crane Motor with Floating Brake Control.

makes of electrically-driven, centrifugal machines being noticed; electricity generating sets, driven mostly by internal-combustion engines, but including a few steam sets, and suitable for ships' auxiliary service or country house lighting purposes, were to be seen on at least 16 stands; one of the oil engines shown by the Parsons Motor Co., Ltd., was of 105 h.p. at 750 r.p.m. with six cylinders, coupled direct to a Brush 44-kW alternator with an exciter on the shaft extension. C. A. Parsons and Co., Ltd., in addition to transformers and an oil-tight terminal tapping, turbine blading (one sample being 42 in. long), samples of generator windings, &c., exhibited a geared turbo-dynamo of 100 kW running at 3,000 r.p.m.; the impulse turbine speed is 10,000 r.p.m., so that the speed ratio of the gear is 3⅓, and the steam conditions are 200 lb. pressure, 162 deg. F. temperature, and 27½ in. vacuum, the steam consumption being 19.8

lb. per kWh, which is reasonable for so small a plant. The weight of the set is 3.4 tons, including the bedplate, which incorporates an oil reservoir and cooler.

Aids to Navigation.

Most interesting is the steady development of aids to navigation, which invariably have electrical features, the tendency being to make such devices more or less automatic. Besides loud-speakers, headphones, and a

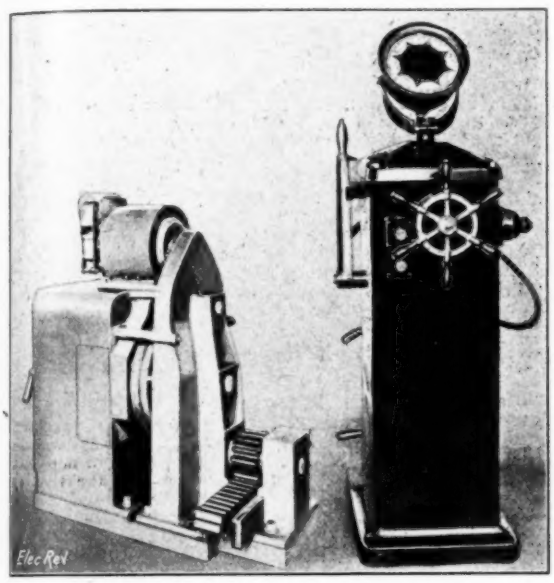


Fig. 10.—Two-unit Sperry Gyro Pilot.

loud-speaking telephone for ships, S. G. Brown, Ltd., showed a British gyro compass employing what is known as "liquid control" and with which is associated a different type of repeater for each particular purpose in navigation.

The Sperry Gyroscope Co., Ltd., demonstrated automatic steering equipment, including a gyro pilot (bridge and wheel house units), helm angle transmitter, and indicator. The master compass is mounted on a turntable and, when moved, represents a change of heading of the ship which is electrically transmitted to all the compass auxiliaries, and also to the contact mechanism inside the bridge unit of the gyro pilot. This unit controls the starting and stopping of the power unit and will move the improvised rudder instantly, which in turn operates the helm angle transmitter, causing the helm indicator to show the rudder movement. Single-unit gyro pilots have been installed in nearly 100 merchant vessels, and on this occasion the new two-unit gyro pilot, fig. 10, made its *début;* it differs from the single-unit type in so far as the contact and power units are separated, the former being on the bridge, while the latter is connected direct to the throttle of the steering

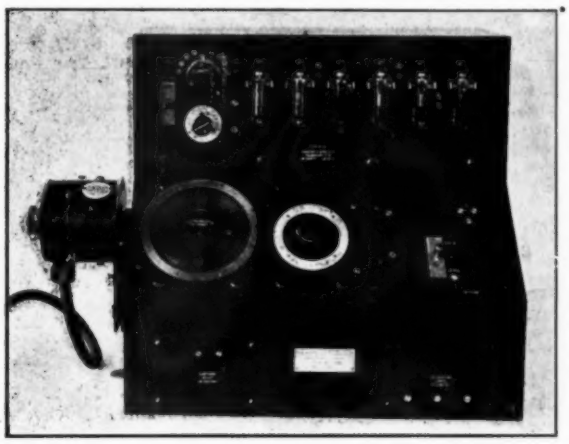


Fig. 11.—Direction Finder and Repeater.

engine. It is thus independent of the telemotor gear and the lost motion which invariably exists in that system; it also makes available duplicate and separate steering control on the bridge. The company's gyro compass equipment includes steering and bearing repeaters, a course recorder, and a repeater combined, with a Marconi radio direction finder as shown in fig. 11. A large percentage of the errors made in fixing the position of a ship by wireless d.f. are due to errors in the compass and reading it; the repeater enables the wireless operator to read the true bearing of any station at sight and is particularly advantageous at long range, in which case the error is proportional to the distance.

(To be concluded.)

The Problem of British Industry.

In the course of a paper which he read on December 2nd, at a meeting of the Liverpool Engineering Society, Sir William P. Rylands, J.P., said that there were three main factors underlying the great problem of British industry; the sociologic aspect, the economic effect of fluctuating currency, and the economic effect upon Great Britain of the war. No solution could be satisfactory which did not take these three factors into account.

Taking the first—the sociologic aspect, Sir William said that it was true that profit was the mainspring of national economic success and prosperity, but it was important to realise that the object was the prosperity of the people as a whole and not the advantage of a few. The war and the post-war period introduced a condition under which the standard of living was definitely raised, and the people of this country were reluctant to allow this to be reduced. It was thought by the workers that the ability of industry to pay these wages at that period indicated that wages could be kept up permanently, although the reply, of course, was that to maintain them we were living on our capital. The pound had been restored to its gold basis, but we had incurred a burden of eight thousand millions of national debt, a great increase in industrial capital, and a serious rise in local rates. If the producers produced only as much as they did before the war, it was inevitable that they must consume less if these burdens were to be sustained. The maintenance of a higher standard of living could only be achieved by substantially increased production—so substantial that the speaker felt that without a change in our economic policy it would be unattainable for many years to come. He was satisfied that in this country the Communist movement had not yet taken deep root, and it was important that we should not confuse the comparatively small Communist element with the vast number of men who cast their votes for Labour candidates from more rational motives. The theoretical Socialists pointed to the vast unsatisfied demand which existed in this country. There was, no doubt, an unlimited demand, while workless men stood idle, and there was evidence of unlimited capital available where there was a reasonable prospect of its profitable employment. The Socialists not unnaturally claimed this as evidence of the failure of the existing capitalistic system, a failure which could not be denied. Their only reply was that their system was as perfect as an imperfect world would allow; that it alone was suited to the peculiar conditions of Great Britain, and should not be changed; and for the rest that Socialism would even more lamentably fail.

Turning to the economic effect of a fluctuating currency, the speaker said that as the value of a currency fell there was a corresponding rise in the cost of all commodities imported into the country, and the world's values, in terms of the currency, were immediately adjusted. The cost of living in this country, however, was affected only to a limited degree by a change in the world's values. Wages and profits were ultimately governed by the internal value of currency, and until the cost of living rose there was no impelling necessity to increase wages. The exact converse was to be expected where the currency of the country appreciated in value, as it had in Great Britain. The return to the gold standard had raised the world's value of the pound by ten per cent., making the real cost of manufacture at least ten per cent. higher than it was 18 months ago. It would readily be appreciated how immensely this had increased the difficulties of our unsheltered industries. On the other hand, sheltered and quasi-sheltered industries, which escaped competition from the Continent, had been able to maintain their prices, wages, and standard of profit, thus greatly affecting the cost of living in this country. For this unsatisfactory condition there were three possible remedies.

viz., an increase in the gold value of Continental currencies; a decrease in the gold value of British currency; or a drastic reduction in wages and profits in the sheltered industries. The speaker considered that the first two remedies were impracticable, and it appeared unlikely also that the sheltered industries would willingly forego the advantages which they enjoyed; it would therefore seem that we must either adopt the policy of *laissez faire*, and hope that time would provide a solution of our difficulties, or examine the effect of any possible change in our economic policy with the object of sheltering unsheltered industries.

The principal economic effect upon Great Britain of the war was the aggregation of the huge national debt in addition to the large debenture and other debts incurred by industry during the same period. This had led to very heavy taxation, which necessarily came largely out of the pockets of the working man. If, therefore, as a result of our war debt, a large share of production was taken to pay interest, the workers engaged in industry must either produce more, or their standard of living must be definitely lowered. It was immaterial whether this increased production was for export or for home consumption, and when we reflected that the export trade of this country in volume was substantially less than before the war, it was clear that the home production must be vastly larger. The speaker believed that the key of the puzzle lay in the velocity of circulation of the purchasing power of the community. In this respect wages were far in advance of profits. If, therefore, wages were high, the "kinetic" energy of the aggregate purchasing power was incalculably increased. If wages were low, they were wholly absorbed in providing food and the bare necessities of life, to a great extent imported from abroad. He thought it a matter for congratulation that so many of our people were manifestly enjoying a relatively high standard of living, and he would regard a reduction with regret. Could we seriously hope to develop an increased export trade sufficient to meet our economic necessities? Throughout the world there was a definite tendency towards the development of national industry, and it was not easy to feel confident that we would be able in the future to do much more than maintain our present position, and there were grounds for apprehension lest, with the increasing industrialism of the world, our export trade would be conducted with ever-increasing difficulty. In a country which was completely self-contained there would be no limit to the standard of living which the people could enjoy, except in their capacity to produce. The United States had to some extent achieved this ideal, and consequently the standard of living there was higher than in any other part of the world. It might be definitely affirmed that the volume of a nation's foreign trade was not a matter for congratulation, but rather a measure of the disadvantage which it endured. These reflections suggested that we should seriously consider whether we had been right in the past in regarding our foreign trade as the first interest of the country, or whether it might not now be desirable that that general policy should be reviewed, and we should regard the development of the home trade as the first consideration. There was no doubt that that policy had been pursued by other countries with success. The solution of the problem of British industry must not be sought by regarding the interest of profit and finance as the first consideration. The prosperity of the working community demanded the utmost amount of employment, the highest possible wages, and the greatest velocity of circulation of purchasing power, by which means alone would the community be most amply provided with the amenities of life.

Russian Electrical Notes.

Swedish Telephones in Russia.—A Moscow dispatch published in Sweden announces that the Soviet Government has permitted the Low-Pressure Trust to enter into an agreement with the Svenska Telefon Aktiebolag L.M. Ericsson, under which the former takes over the exclusive right to manufacture and sell automatic telephone equipment on the Ericsson system in the Soviet Union, Afghanistan and Mongolia, together with the right of working all the Ericsson patents in Esthonia, Lithuania, and Latvia. Moreover, the Swedish company will supply all the equipment for automatic exchanges in Russia and will grant a long term credit. An inquiry made by the representative of a Stockholm newspaper elicited the statement from Mr. E. O. Sandberg, director of the company, that no confirmation of the telegram had then been received, although the company had carried on negotiations during the summer with the Low-Pressure Trust in Moscow. This information, which was published in Sweden on November 3rd, is now confirmed by the Moscow newspapers.

Suburban Railway Electrification. — The board of the State Planning Commission has approved a scheme submitted by a committee for the introduction of electric traction on the Northern and Moscow-Kazan railways between 1927 and 1929. The expenditure is estimated at 28,900,000 roubles, of which it is proposed to provide 4,000,000 roubles in the current fiscal year. Each train is to be composed of a motor car and two trailers, each capable of accommodating 160 persons. Each motor car is to be equipped with four 200-h.p. motors, and the speed is to be 28 miles per hour as compared with about 20 miles at present with steam locomotives. It is proposed to obtain the electrical equipment in the first place from abroad, and offers are said to have already been received; subsequent plant will be made at Russian works.

The Financing of Electrification Works. — One of the directors of the Electrical Bank states that a total of 51.3 millions of roubles was provided out of the Budget for electrification works in the year ended with September, 1925, this amount comparing with an average of 28 millions in the past three years. Besides this sum the bank issued credits for a total of 27.6 millions down to September 1st. These figures will be surpassed in the new financial year as the Supreme Council of National Economy has made application to the State Planning Commission for the insertion in the budget of a total of 150 millions for electrical works, while the bank itself expects to grant loans to the extent of from three to four times the amount of its capital.

Production in the Past Year.—According to the provisional figures prepared by the General Electric Commission, the production of the electrical manufacturing industry during the year ended September 30th, 1925, represented a value of 62,700,000 roubles or an increase of 83 per cent. over the year 1923-24. In the case of the machine construction works the output reached 12,400,000 roubles or 111 per cent. more than in 1923-24, while the output of the low-pressure works rose from 3.5 million roubles in 1923-24 to 8.4 million roubles in 1924-25. The value of the production of the cable works increased by 50 per cent. and that of lamps by 105 per cent. The number of workers employed rose by 26 per cent., although the adoption of improved mechanical methods in the lamp factories permitted of a reduction in the number of persons employed there. The output of the porcelain works was increased by 136 per cent., although the number employed rose by only 3 per cent. As to the value of the turnover in 1924-25, it is stated that the sales amounted to 82,100,000 roubles, as compared with 42,900,000 roubles in the previous year. The value of the sales grew quarter by quarter and, despite the expansion in the production, the demand exceeded the supply. During the year the prices of a number of products were reduced, particularly in the case of lamps, but the prices of machines were not lowered and are not expected to be reduced. The financial situation of the trusts remained strained throughout the year owing to the extension of the production without sufficient working capital.

Petrograd Lighting Situation.—As a result of delays in the delivery from abroad of the new sets of turbines for the Krasnya October station, the existing stations supplying Petrograd are fully loaded, and it has been necessary to set in operation again isolated generating plants of a combined capacity of 20,000 kW in order to cope with the demand.

Development in the Ukraine.—It is reported from Kharkoff that the commission on the electrification of the Ukraine has decided that it is necessary to construct stations in the districts of Krivoi Rog and Zaporozjen of capacities of 15,000 and 20,000 kW respectively. In the future these two stations would serve as steam reserves for the projected Dnieper hydro-electric works.

Low-pressure Apparatus. — The Low-Pressure Trust is experiencing a constantly growing demand for telephone, telegraph, and radio apparatus, &c. The orders received in September are stated to have reached record figures at a value of 6,300,000 roubles, or more than the total turnover in 1923-24. It is intended to extend the productive capacity of the various works so as to be able to meet the requirements.

Reductions in Lamp Prices.—The board of the Supreme Council of National Economy has made reductions in the wholesale and retail prices of the various kinds of incandescent lamps. At the same time the board has drawn the attention of the General Electrical Commission to the unsatisfactory quality and high cost of lamp glass, circumstances which considerably hamper a reduction in the costs of production, and it is added that the lowering of prices must not result in impairing the quality of the lamps.

The Accumulator Trust.—The value of the output of the Accumulator Trust in the year 1924-25 is reported to have been 1,724,000 pre-war roubles. The production during the current year is expected to reach a value of 2,960,000 roubles.

An Extension Fund.—As a result of the growing demand for electrical energy the General Electrical Commission has decided to create a special fund for extensions of works and the provision of new equipment. An inquiry is now being made as to the sources which are intended to be drawn upon in order to feed this fund, into which it is also proposed to pay the amounts set aside by different undertakings for the purpose of redemption.

October Production.—The value of the production of the various electrical trusts in October, which was the first month of the new financial year, is returned at 7,510,000 pre-war roubles, of which 6,096,000 roubles is credited to the State Electrical Trust, 975,000 roubles to the Low Pressure Trust and the balance to the Accumulator Trust. The output represented 84.5 per cent. of the production fixed under the programme.

The Volkhoff Hydro-Electric Works. — The progress in connection with the large hydro-electric works known as the Volkhoff station has been so considerable that it is expected that two turbo-generator sets will be set in operation next May and a full supply inaugurated in October, 1926. The main transformer stations in Leningrad, which are to be supplied by this station, have been practically completed, while the smaller sub-stations will soon be finished, together with the Leningrad cable network.

Reviews.

High-Pressure Electricity Transmission and Distribution.*

In view of the rapid development that is taking place in electricity transmission and distribution in all parts of the world it is nowadays not an easy matter for electrical engineers, young or old, to keep themselves fully posted with the progress that is being made. It is for this reason that the international conferences that are now being held almost annually are of value in that they form a common platform for the interchange of experiences and ideas of leading electrical engineers from all parts of the globe. Moreover, to those unable to attend the conferences, the very complete records of the proceedings that are subsequently published afford a means of digesting, as opportunity offers, the various solutions of the many difficult problems that beset all engaged in the work of electricity transmission and distribution, while at all times they form valuable additions to the electrical engineer's reference library.

A case in point is the volume which has lately reached us containing a complete record of the proceedings of the second International Conference on Large Electricity Distribution Undertakings at High Pressure which was held in Paris towards the end of 1923. In contradistinction to the World Power Conference held at Wembley last year, which dealt with all aspects of the subject of power, the Paris Conference was devoted to the single subject outlined above, which, however, embraces so many sub-subjects—if one may use such a term—that if it did not exceed the importance of the Wembley gathering, it is to the electrical engineer at least equal thereto. Some idea of the ground covered by the various reports and papers presented, all of which, together with the subsequent discussion thereon, are printed *in extenso* in the *Transactions*, may be obtained from the following summary of the particular questions allotted to the 1923 Conference :—

The Construction of High-Pressure Transmission Lines.
Insulators for Extremely High-Pressure Work.
The Construction and Working of Open-Air Transformer Stations.
The Selection of Transmission Pressures.
The Value Ratio between Kilometric Industrial Insulation High-Pressure Lines and the Service Pressure.
High-Pressure Cables.
Making Known the Dangers as well as the uses of Electricity.

Having published an account of the proceedings of the Conference at the time, and for reasons of space pressure, it is impossible for us now to refer to each of the fifty odd reports and papers presented, and hence a summary, and a brief reference to some of the more important contributions, must suffice. In the first section—that devoted to Current Generation and Conversion, there were only two papers, both, curiously enough, by American authors, one dealing with Outdoor Transformer Station Practice in the United States and the other with Recent Improvements in Oil Interrupters. On the subject of Transmission Masts and Conductors, there were altogether eleven contributions, four being from French authors, three from Italian and Swedish, and one British, this being by Messrs. E. B. Wedmore and W. B. Woodhouse, on "Recent British Investigations into Overhead Line Construction and the Material Employed." Insulators—Their Composition, Microstructure and Properties, brought together nine papers, in which American, French, Italian and British-Spanish practice was outlined, the subject giving rise to a lengthy and valuable discussion. Equally varied in experience and practice were the eight papers on Underground Cables which emanated from Dutch, French and Italian engineers, and from the British delegates, Messrs. P. V. Hunter and E. B. Wedmore, who dealt exhaustively with the question of the Heating of Conductors Embedded in the Ground.

Only one paper was submitted on the question of Educating the Public as to the uses of Electricity, this being by a Dutch author, who dealt at considerable length with the methods adopted in Holland in teaching children both the uses of electricity and the dangers associated therewith, the paper being notable for some very curious illustrations. Section II of Part 3 of the proceedings will doubtless be regarded by some readers as one of the most important as it includes particulars of the rules and regulations in force, or projected, in France, Switzerland, Holland, Belgium, Poland, Russia and Great Britain, in regard to the establishment of electricity transmission lines at very high pressures with the object of securing the public safety, many useful suggestions being made in the subsequent discussion. Three authors—American, French and Italian—gave their ideas with regard to transmission pressure standards, while the wide range of international experiences recorded in Part IV, which deals with The Operation and Protection of High Pressure Transmission Lines and with Pressure Measurements, is evidenced by the fact that the authors represented seven countries. The final paper was one by M. E. O. Meyer, of the Strasburg electricity station on "The Means of Communication in Electrical Undertakings," in the course of which he alluded to the prominent part wireless telephony is likely to play in the not-far-distant future.

The Conference was attended by electrical engineers from no fewer than twenty countries, Great Britain being represented by delegates from the Institution of Electrical Engineers, the British Electro-Technical Committee, and the Electricity Commissioners, as well as by eight independent members, and a useful feature of the volume is an alphabetical list not only of the names of the authors of the papers, but also of all who took part in the discussions. Furthermore, their addresses are also given, thus affording any electrical engineer who may desire additional information on any particular point an opportunity of communicating direct. The *Transactions* are printed throughout in French, and in view of the fact that various languages were used during the meetings, the work of compiling the report is a tribute not only to the editing capabilities of M. Jean Tribot Laspière, the general secretary of the Conference and of the Union des Syndicats de l'Electricité, and his staff, but also to the translators. Altogether there are nearly 1,200 pages in the volume, which also includes approximately 400 line and photographic illustrations, rendering it, as we have already said, a valuable work of reference to all interested in electricity transmission and distribution at high pressures.

C. J. W.

*The verbatim report of the second High-Pressure Conference, held at Paris, November, 1923. Edited by J. Tribot Laspière, General Secretary of the Conference. Pp. 1159; fully illustrated. Paris: l'Union des Syndicats de l'Electricité. **Price, 120 fr.***

Primer of Costing. By R. J. H. RYALL, F.C.W.A. Pp. viii + 115; 27 charts and forms. London: Sir Isaac Pitman and Sons, Ltd. **Price 5s. net.**

When one of the leading cost consultants in the Kingdom, Mr. R. J. H. Ryall, writes a Primer of Costing, one's interest is naturally aroused. It would appear, at first sight, that not only is it late in the day for a primer on this important subject to be written at all, but also that, from the pen of one who is so well placed in the profession, a treatise on advanced costing was to be expected.

A glance at the first chapter is, however, sufficient to dispel any such misapprehension, for one is reminded that there is, so far, no authoritative terminology of costing; that no two firms treat certain items of cost in exactly the same manner, particularly their items of establishment expenses; moreover, that this is the first primer of costing that has been published in this country.

That many people think they know all there is to know about costing, when they have scarcely probed beneath the surface, is only too clearly demonstrated by the fact that many firms, professing to have the soundest of costing systems, possess, in actual fact, a most unwieldy object which gives them some figures now and again, and which has been evolved by means of a series of spasmodic additions and minor revisions, introduced by generations of men. If some of these would study this primer, forget for a while the supposed glories of their own pet systems, and begin to think carefully upon the precepts and first principles herein laid down, their trade and industry would be the better fitted to withstand the ever present competition that it is called upon to face.

The preface tells us that the book is written for cost clerks, and particularly for those who contemplate sitting for the examinations of the Royal Society of Arts. The author is too modest. The work should be read by everyone interested in costing, for it cannot fail to give him a clearer view of the beginning of things; to those who depend upon costing in their business, its perusal is a necessity.

The book takes the reader through each stage of costing and outlines the steps needed in cost finding, cost control, and cost estimating. Each point is dealt with simply, but effectively, in language that is straightforward and to the point. There are no diversions into abstruse theories and no endless complications. Twenty-seven forms and charts illustrate the text and these in themselves are most valuable, for they are obviously designed by a practical man who understands that the workshops require, in all cases, the simplest possible form that will effectively serve its purpose. If such forms as these are employed, there can be no doubt in the workers' minds as to what they are expected to enter, where they are meant to write it, and why it is asked for. Therein lies one of the problems of the cost accountant. It is easy to make complicated original records, which are invariably filled in wrongly and cause the men in the shops to waste their time trying to find particular spaces. Sooner or later, information will be required which is not found to be immediately available from the existing records, with the result that a further form has to be added. After a while, many extra forms are introduced and more or less conscientiously filled in, but only used when particular information is required. Files, bearing all this matter, are stacked up, and the clerks have to spend large portions of their time on work, only a small portion of which is actually useful. The correct design of forms in the first case, by one really familiar with actual requirements, saves endless waste. All cost accountants would do well to have a periodical "stocktaking" of their forms, in order to weed out duplicated or superabundant information.

Another point in this book that attracts attention is that Mr. Ryall has got away from engineering in his main and in most of his other examples. So many of the text books on costing, and particularly those that come over from the States, make it appear that the one, and perhaps the only, field for costing is the engineering industry. Here we are told of the cost of buttons in ready-made clothing and other homely necessities of life. It is, to say the least of it, bracing. The reader will find that "something different" to stimulate his interest.

Almost every term used is defined. Terms need defining nowadays, for the standardisation of terminology proceeds but

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slowly, and is, so far, a long way from being an accomplished fact.

There are many points upon which we feel we should like the author's opinion and which we should like to see treated in his book, such as a simple calculation of machine rates, examples of the executive uses of costs, the relation of estimating to costing, an example of cost analysis—but we must remember that it is a primer we are reading, and we can only admire the restraint of the author in refraining from treating at length the higher branches of costing before the "grammar" is understood. To have touched upon the points enumerated would have meant departure from a general treatise on costing and the introduction of examples drawn not only from particular industries, but from particular factories. We must, therefore, in this connection, look forward to the day when the author sees fit to deal with costing in its more advanced and more particularised aspects.

"A system of cost accountancy must be devised to fit the business and not the business to the system," is a sound warning to those inclined to rely on ready-made systems.

The notes in the concluding chapter are of great importance. They deal with the routine and procedure of work in a cost department, and here, for the first time, we think, is laid down the correct fundamental duties of cost clerks. It would be well if every firm studied the "progressing" of work in its offices. Clerical work is too often looked upon as an unnecessary evil. Paradoxically enough, little attention is paid to the question of wasted effort in this sphere. It would surprise many a manager to find what saving could be made by detailing just what each of his clerks is expected to do, how and when he is to perform each of his duties and what is the value of his work.

There is an appeal in this book to many different classes, chief amongst which are:—

(*a*) The Manufacturer, who prides himself upon the adequacy of his own costing system, for he may recognise that even in his cherished methods there may be some important error of principle.

(*b*) The Cost Accountant, who is absorbed in the routine of his costing and in the tabulation of results and statistics, for, if nothing more, it will be refreshing to him to think of the why and the wherefore of the first principles.

(*c*) The Consumer, who may be searching for knowledge of what the other half of the world does, for he will be given a concise survey of how manufacturers and distributors should endeavour to give equitable prices instead of making him pay for wastages.

(*d*) The Technical Man, who is responsible for design and economic manufacture, for then he will be shown what benefits he should expect in return for the shop records which he sends to the cost department; and

(*e*) The Student, for whom the book is essentially written.

We have no hesitation or fear in recommending Mr. Ryall's Primer of Costing to anyone who falls within any of these classifications, and we heartily congratulate the author upon the production of a readable book which fills a long-felt want in the literature of costing.

Legal.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

THE judgment of the Court of Appeal in favour of the plaintiffs and appellants was recorded in our last issue. Later, Mr. TREVOR WATSON, for the defendants, said that their Lordships' refusal to grant a stay of the injunction had led to a serious question regarding the defendants' current contracts. They had, however, obtained the plaintiffs' permission to deliver machines on order, and had agreed to pay the plaintiffs 10 per cent. on the value of the starting motors and rotary converters so delivered.

Sir Duncan Kerly, K.C., confirmed this and the Master of the Rolls acquiesced.

International Wireless Manufacturers, Ltd.

IN the Companies Winding-up Court on December 1st, Marconi's Wireless Telegraph Co., Ltd., petitioned for an order for the compulsory liquidation of International Wireless Manufacturers, Ltd.

It was stated that the plaintiffs were judgment creditors of the respondent company, the amount of the debt and costs being £247. The company's capital was £100, but, a few months after it was formed, debentures for £4,000 were issued.

Counsel for the respondent company asked for an adjournment until the first petition day in February next, as the company hoped to raise fresh capital.

In this case Mr. Justice Romer earlier in the day made a compulsory order, the company not being represented, but on it being explained that the absence of representation was due to inadvertence, his Lordship granted the adjournment to which the petitioners consented.

Unprotected Electrical Apparatus.

AT Accrington on December 2nd, the Broadoak Print Works, Ltd., Accrington, a branch of the Calico Printers' Association, was fined £10 for a breach of the Factories and Workshops Acts, 1901 to 1911.

Mr. H. TOPHAM, H.M. Inspector of Factories, said the case was the sequel to an accident to James Carter, electrician's labourer, who was found in a drying-room unconscious with his neck against a portable electric standard. He died soon afterwards. Adequate precautions had not been taken to prevent the standard from becoming electrically charged.

For the defence it was submitted that every precaution had been taken.

British Thomson-Houston Co. Litigation.

IN the Chancery Division on Friday (December 4th), Mr. Justice Tomlin heard a motion by the British Thomson-Houston Co., Ltd., for an injunction restraining infringements of its patents relating to electric lamps by E. A. Siderman, R. H. Wood, and Walter Thomas Smith, Ltd.

Mr. TREVOR WATSON, for the plaintiffs, said they had obtained injunctions against a large number of small retailers, that being the only method of preventing the importation of foreign lamps. But the multitude of injunctions had made importers exceedingly wary, and as a result there was a considerable and highly-organised business in these lamps which made it very difficult to get evidence. The manner in which it was carried on was this: The importers sent the lamps to a warehouse, and they could not be got from there except by telephone. The importers had appointed a number of retail dealers, and they also were very wary and would not treat with anybody who was not known to them. Nor would they treat except by telephone messages. They never kept any stock, they said, and got lamps from the warehouse in response to telephonic orders. If a particular retailer was stopped by injunction the principals had no difficulty in appointing another. Thousands of pounds' worth of foreign lamps were sold every week, and the Board of Trade returns showed an enormous importation of these lamps. This was the first occasion on which the plantiffs had been able to track a retailer to the actual warehouse, and the defendants were two retailers and the people who appeared to be in charge of the warehouse.

The evidence as to purchase was contained in affidavits. One witness said that on November 16th he went to Albany Wharf, Albany Street, N.W., the gates of which bore the name Walter Thomas Smith, Ltd. He told a man that he wanted to buy some foreign electric lamps, and was referred to Siderman at Grafton Street, Tottenham Court Road, as they did not deal with small orders there. At Mr. Siderman's he was informed that all business must be strictly confidential and nobody must be told the price which he had paid, nor was he to tell anybody in the street what he had got in his parcel. No lamps, said Mr. Siderman, were kept on the premises, and customers must telephone their orders. He obtained the lamps that he wanted. Another witness said he followed a messenger with lamps from Albany Wharf to Grafton Street, and a further witness swore that Walter Thomas Smith, Ltd., paid the rates of the wharf.

There was no appearance for the defendants and his Lordship granted the injunction asked for.

IN the Chancery Division on December 4th, Mr. Justice Tomlin granted an injunction on the *ex parte* motion of the British Thomson-Houston Co., Ltd., restraining the London Electric Lamp Co., of Sandcroft Street, Kennington, S.E., from infringing its patents for leading-in wires for electric lamps and gas-filled lamps. His Lordship said the injunction would be over last Tuesday (December 8th).

Manchester Electrical Engineers' Dance.—We do not know whether electrical engineers are more enthusiastic about dancing than, let us say, lawyers or physicians, but it is noteworthy that three large annual functions are now devoted to this form of amusement.

Of these, the Manchester or Northern dance was held last Friday, December 4th, at the Midland Hotel, and was attended by some 260 engineers and their friends. Unhappily, the very dense fog which prevailed all day caused a number of notable absentees, but those who succeeded in surmounting this difficulty spent a most enjoyable evening. It is well known that what Lancashire does to-day, the rest of England will do to-morrow, and readers in Birmingham and London (where they also dance) may care to note the unusual nature of the Manchester programme. A dinner was served at 9.15, following the first three dances, so that the guests might secure that "after supper" feeling early on. After a few more dances, a cabaret show was given, and still later an exhibition dance was performed by the professional exponents attached to the Midland Hotel.

The distribution of gaily coloured favours in the shape of hats, parasols, balloons, &c., added greatly to the general amusement, and Mr. G. H. Fawcus (the hardworking hon. secretary) and his colleagues who carried out the executive work which such a function requires may congratulate themselves heartily on a very successful evening.

Electricity in an Ancient Setting.—The Hastings Corporation is to supply electricity to Rye and Winchelsea and has agreed to preserve the "old-world" appearance of these historic towns by adopting street fittings to fit in with the surroundings.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Christmas Holidays.—The ELECTRICAL REVIEW for December 25th will appear one day in advance of the usual time of publication owing to the Christmas holidays. The attention of advertisers is therefore called to a notice appearing in our advertisement pages to-day. Alterations to existing trade advertisements for that issue must be received by Wednesday, December 16th, but copy for Official Notices, Situations Vacant, &c., will be in time if delivered at 4, Ludgate Hill, E.C., by 5 p.m. on Monday, December 21st. Correspondents and other contributors to our editorial pages are also requested to bear the earlier publication arrangements in mind and to forward their articles and news items without delay.

The Shannon Scheme Dispute.—At a special meeting of the Free State Labour Party and the Trade Union Congress in Dublin last week, it was decided to treat the Shannon project as "black." A resolution was passed condemning the rates of wages offered, declaring that the Free State Government's policy must be fought, and instructing trade unionists not to work on the scheme. Senator O'Farrell said that the Government was endeavouring to impose "slave-like conditions of labour," and asserted that the Government would never be able to carry the scheme to a successful conclusion, for competent workers would not accept the terms. Mr. Tom Johnston said he found that if 50 per cent. more than the amount allowed for the cost of labour under the Shannon scheme—£90,000—were expended, the scheme would still be economic, and would not involve an increase in taxation or charges for electricity.

Recent Contracts.—Members of the Federation of British Industries have recently received important contracts, among which are a number of orders for valves, including those for the Arapuni (New Zealand) hydro-electric scheme, secured by Messrs. J. Blakeborough & Sons, Ltd.; electric locomotive hoists for railways in China, India, and Brazil, and two electric luffing jib cranes for the Nitrate Railways Co., Ltd., ordered from Messrs. Ransomes & Rapier, Ltd.; and the supply of steelwork for sub-station buildings in connection with the electrification of the Bombay, Baroda and Central India Railway, by Messrs. Wm. Bain & Co., Ltd.

E.D.A. Activities.—We have received some further examples of the advertisements which the British Electrical Development Association is inserting in newspapers and periodicals during the current winter. These are very attractive, but their chief value lies in their adaptation to the class of paper in which they appear. This is an important matter which is not always considered by advertisers, who are often content to let the same advertisements do for journals which cater for widely-separated interests.

Works Visit.—During the recent annual meeting in Birmingham of the Coke Oven Managers' Association, a party of members paid a visit to the Witton Works of the General Electric Co., Ltd. The Magnet Club was put at the visitors' disposal for the day, and they were entertained to luncheon by the company, Dr. A. H. Railing being in the chair. At the luncheon Mr. P. T. Nicholson, president of the Association, expressed the members' thanks to the company.

Salford Tramway Dispute.—About 150 men employed at the Frederick Road tramway depôt of the Corporation Tramway Department, ceased work on November 26th following the suspension of two men and three youths. The terms provisionally agreed upon by the Department and the trade union officials for the settlement of the dispute were accepted by the men later, and they resumed work on December 3rd. During the strike the normal tramway service was fully maintained, with the exception of a few cars awaiting repair.

Safeguarding Iron and Steel.—Efforts are being made to secure the imposition of an import duty on foreign iron and steel. The Civil Research Committee has investigated the position and is expected to issue a report shortly. On December 2nd a number of representatives of the industry, including Sir Arthur Dorman, Sir Frederick Mills, and Mr. Peach, met the Unionist Safeguarding Committee and presented the case for the inclusion of the iron and steel industry in the provisions of the Safeguarding of Industries Act. The Committee expressed itself as being in favour of the scheme and promised to bring the matter to the attention of the Government.

Local Exhibitions.—TODMORDEN.—On December 1st an electrical exhibition was opened at the Todmorden Town Hall. Councillor J. Jackson (chairman of the Electricity Committee) presided, and said that town life could not be what it ought to be until electricity was used exclusively for heating, lighting and cooking.

BURNLEY.—In addition to opening a special showroom in Manchester Road, the Burnley Electricity Committee has decided to organise an electrical exhibition in the centre of the town, and a committee has been appointed to make the necessary arrangements.

BACUP.—The Corporation has decided to hold an electrical exhibition in the town in February next.

Rubber Industry.—On Monday last, at the meeting of the Institution of Rubber Industry, held at the Engineers' Club, London, Dr. S. S. Pickles, chairman of the Rubber Research Association Library and Information Bureau Committee, read a paper on "The Importance of an Adequate Intelligence Service for the Rubber Industry."

Textile Mill Electrification Contracts.—Several important contracts for electrical driving and direct-geared turbine driving of textile mills, both at home and abroad, are being executed by the Metropolitan-Vickers Electrical Co., Ltd. The principal home contracts include the Victoria Cotton Mills of Messrs. J. & J. Hayes, Leigh, Lancashire; the Park Lane and the Greenbank No. 1 and No. 2 mills of Messrs. John Hawkin and Sons, Preston; the Rishton Mill of Messrs. O. & J. Folds, Ltd., Burnley; and the Bleach & Dye Works of Messrs. John Welch & Sons, Chinley. The equipment of the Victoria Mills includes a 2,000-kW, 3-phase, 2,200-V, 3,000 r.p.m. turbo-generator, and motors totalling about 3,000 h.p. The electrical equipment in hand for the three mills of Messrs. John Hawkins and Sons includes motors totalling over 3,500 h.p.; for the Rishton Mill motors totalling about 500 h.p. are being supplied; and the equipment now being installed at the important works of Messrs. John Welch & Sons includes two generators of 250 kW and 50 kW respectively, and motors totalling about 400 h.p. An order for a new mill at Sao Paulo, Brazil, includes motors totalling 730 h.p. and transformers with an aggregate capacity of 2,100 kVA. Other contracts for Brazil include motors totalling over 1,200 h.p. for use in eight different mills.

Lead. — Messrs. James Forster & Co. state under date December 5th:—"If the fall in America continues, as from all indications appears to be probable, prices must recede further here as there is not sufficient demand in this country or on the Continent to absorb American lead as well as the large supplies from Australia and elsewhere."

British Insulated Change of Name. — THE BRITISH INSULATED & HELSBY CABLES, LTD., has, by extraordinary resolution, passed last Friday, decided to change its name to British Insulated Cables, Ltd.

The British Industries Fair.—*Reuter* (Montreal) reports that many Canadian manufacturers will send exhibits to next year's British Industries Fair. Through the good offices of Mr. F. W. Field, the Senior British Trade Commissioner, considerable interest has been aroused in the Fair in Canada.

Trade Announcements.—MR. R. CHILDS has retired from his partnership in Erlco at Reading, and Messrs. Bravey and Blackmore, the remaining partners, are carrying on the firm. Mr. Childs is opening business as an electrical engineer at Station Road, Henley-on-Thames, and asks for copies of catalogues and lists.

MESSRS. GEORGE H. SCHOLES & CO., LTD., Manchester, announce that they have made an alteration in their "Sanco" joint box, and have reduced the price.

Catalogues and Lists.—MESSRS. BLACKSTONE & CO., LTD., Aldwych House, W.C.2.—An illustrated folder dealing with an unchokeable pump with various forms of drive.

BRITISH INSULATED & HELSBY CABLES, LTD., Prescot, Lancashire.—Catalogue P.192, containing full details and illustrations of pole transmission line equipment. A great deal of useful technical information regarding transmission-line design is given at the end of the publication.

MESSRS. R. A. LISTER & CO., LTD., Dursley, Gloucestershire.—An illustrated catalogue, with price list, of small electric lighting and power plant, including switchboards, batteries, and other auxiliaries.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., U.S.A.—Motor Application Circular No. 7,378, dealing with the use of electrically-driven machinery for handling materials. Illustrated.

THE IGRANIC ELECTRIC CO., LTD., 147, Queen Victoria Street, E.C.4.—Leaflets Nos. 920 and 925, dealing, respectively, with oil-immersed and air-break, hand-operated, star-delta starters.

MESSRS. FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, E.C.1.—A showcard advertising the "Efesca" regenerative aerial tuner; also a catalogue (No. 563) of "Efesca" signs, lanterns, and reflectors. Illustrated and priced.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Folder O.S. 3793, containing particulars and prices of "Osram" radio valves; a circular letter dealing with the company's counter service; also Leaflet O.S. 3,794, describing "Osram" decorative lamp outfits.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—A priced pamphlet describing the "Dakol" daylight unit.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—December price sheet of electrical materials and appliances.

MESSRS. CUNNINGHAM, 169-171, Edgware Road, W.2.—An illustrated price list of radio receiving sets.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 109-111, New Oxford Street, W.C.1.—List No. M.7, containing illustrations, specifications, and prices of d.c. and a.c. motors.

THE WATLIFF CO., 87, Cambridge Road, Kilburn, N.W.6.—A net trade price list of commutators for small motors and generators, including automobile and fan machines.

BRITISH BROWN-BOVERI, LTD., Trafalgar House, Waterloo Place, S.W.1.—An illustrated pamphlet advertising the company's turbo-alternators, and the "Brown-Boveri Review" for November, describing work carried out by the company's Swiss principals.

THE VISCO ENGINEERING CO., LTD., 162, Grosvenor Road, S.W.1.—Publication No. 243, containing an illustrated description of the company's cooling towers.

THE MULLARD WIRELESS SERVICE CO., LTD., Nightingale Lane, Balham, S.W.12.—A display carton for shop windows advertising "Mullard" radio valves.

MESSRS. R. ROBERTS, LTD., 53, Newton Street, Birmingham.—An illustrated trade price list of radio components.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—A series of cardboard cut-outs advertising "Mellovox," "Baby," and "Dinkie" loud-speakers, and a window card advertising Marconi valves.

THE EAST LONDON RUBBER CO., LTD., 29-33, Great Eastern Street, E.C.2.—An illustrated price list of Christmas presents, including a number of electrical appliances.

Bankruptcy Proceedings.—W. R. SQUIRE, 11, Steward Street, Spring Hill, Birmingham, electrical engineer.—The public examination of this debtor was held on December 2nd, at the Court House, Birmingham. The statement of affairs showed liabilities expected to rank of £67 and a deficiency of £41. Debtor said that he commenced business as an electrical engineer in 1907. The business was discontinued in March, 1916, when he was employed on munitions, and he subsequently joined the Navy. In April, 1919, he recommenced business as an electrical engineer with a capital of £140, and was successful until May, 1923, but by reason of certain loss he found it difficult to continue. The examination was closed.

D. A. GRIFFITHS, Abercwmboi, and R. L. H. HUGHES, Aberdare, Glamorganshire, lately trading in partnership at Aberdare as Griffiths & Hughes, electrical engineers.—The first meeting of creditors was held on December 4th at Cardiff. According to the statement of affairs, there were gross liabilities of £509, of which £472 was expected to rank, and assets of £30, leaving a deficiency of £442. Debtors attributed their failure to losses on contracts through underestimation and trade depression. The Official Receiver remains trustee.

M. BREINGAN, electrical manufacturers' agent, 57, Robertson Street, Glasgow.—Public examination December 21st, at Mr. Sheriff Fyfe's chambers, County Buildings, Glasgow. Meeting of creditors January 18th, at the Faculty Hall, St. George's Place, Glasgow.

W. P. YOUNG, trading as W. P. Young & Co., and the Leicester Tanning Machinery Co., Sanvey Gate, Leicester, mechanical and electrical engineer.—An application for the discharge of this debtor was heard on December 3rd, at the Castle, Leicester. The discharge was granted subject to debtor's consenting to judgment for £50.

E. O. HENSTOCK, electrical engineer, 21, Old Road, Brampton, Chesterfield.—Receiving order made December 2nd, on debtor's own petition.

W. R. J. WHITE, electrical agent, 29, Great Pulteney Street, W.C.—Bankrupt discharged subject to consenting to judgment for £50 being entered against him by the Official Receiver (£50 paid to the Official Receiver in lieu of entering up judgment).

L. N. STRIBLING and A. E. SETTERFIELD (Stribling & Setterfield), electrical engineer, 17, Market Place, Margate.—Trustee, Mr. A. H. Ward, Official Receiver, 10, Burgate Street, Canterbury, released November 30th.

H. WILSON, electrical contractor and decorator, 1057, Grangefield Avenue, Thornbury, Bradford.—Last day for proofs for dividend December 18th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

J. N. DAVENPORT and L. A. HACKETT (Davenport, Hackett and Co.), electrical engineers and contractors, 36, Spring Gardens, Manchester, and Albert Mills, Albert Street, Manchester.—Last day for proofs for dividend, December 18th. Trustee, Mr. A. Grierson, 21, Spring Gardens, Manchester.

NEWMAN & CO., radio and electrical engineers, Radio House, 17, Shepherd's Bush Green, W.—Receiving order made November 25th, on creditor's petition. First meeting, December 10th; public examination, February 19th, both at Carey Street, W.C.

A. A. WATMOUGH, carrying on business together with W. HURWORTH in co-partnership as Hurworth, Watmough & Co., electrical engineers, 41, Town Street, Horsforth, and 1, Back James Street, Harrogate.—Application for discharge to be heard December 21st, at the County Court House, Leeds.

R. L. FOGGIN (Tithebarn Radio Co., Crosby Radio Co., and High Bridge Radio Co.), 63, Tithebarn Street, Liverpool, 75, Crosby Road North, Waterloo, Liverpool, and High Bridge, Newcastle-on-Tyne.—Last day for proofs for dividend, December 16th. Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool.

Dissolution of Partnership.—PECOVER & ADEANE, furnishing manufacturing ironmongers and electricians, 9 and 10, Bathurst Street, Hyde Park Gardens, W.—Mr. F. T. Pecover and Mr. H. Adeane have dissolved partnership. Mr. Pecover will attend to debts and will continue the business under the same style at the same address.

Company Liquidations.—BURY ELECTRIC PLANT CO., LTD.—Winding up voluntarily. Liquidator, Mr. T. S. Smith, of Messrs. C. R. Scholes & Co., Silver Street Chambers, Bury. Meeting of creditors December 11th, at the liquidator's offices. Particulars of claims to the liquidator by December 31st.

GALLETTI'S WIRELESS TELEGRAPH & TELEPHONE CO., LTD.—A meeting of creditors is called for December 14th, at the Liquidator's Offices, 36, Walbrook, E.C. Particulars of claims to be sent to the Liquidator, Mr. H. J. Page, by December 31st.

Private Arrangements.—MORRIS KELLY, 12, Jackson's Row, Deansgate, Manchester, wholesale and retail wireless storekeeper.—A meeting of the creditors of the above was held on December 2nd, when Mr. Gillett presented a statement of affairs as at November 26th, which showed liabilities of £1,309, all due to unsecured trade creditors, and there was an estimated deficiency, subject to the costs of realisation, of £749. Mr. Gillett said that there had been several judgments, and accordingly, for the protection of the assets, a deed of assignment was executed in his favour. Unless something like 10s. in the £ were forthcoming, the creditors would probably decide on bankruptcy. The debtor started the business at 12, Jackson's Row, Deansgate, as a wholesale and retail wireless storekeeper, on April 14th, 1923. Previous to that, he had been a photographer, commission agent, &c. The debtor had informed Mr. Gillett that his capital was £100, and he also borrowed £250 from a son. The debtor had no offer or scheme to put forward. At the present moment he was contemplating starting in another business. It was resolved that the deed of assignment already executed should be registered, and that an offer should be accepted of 10s. in the £, payable at 3, 6, 9, and 12 months, the whole 10s. to be guaranteed, failing which the estate would be dealt with in bankruptcy.

The following are creditors:—

	£		£
Lever, E. J.	230	Ripaults, Ltd.	41
Dundas Fox, W.	117	Palatine Accumulators Co. ...	43
Toubkin, J.	24	Forms Co.	28
Houlman, L.	33	Watnell Wireless Co.	29
Manchester Building Hardware Society, Ltd.	24	Battery Co.	169
Erewash Electrical Wire Co. ...	22	S. D. H. Manufacturing Co. ...	141
Turncock, G.	20	Corby Engineering & Wireless Co.	20

Deed of Assignment.—A. B. WAKELING and F. D'A. WRAY (Wakeling & Wray), electricians, 22, Paragon Street, Hull.—Particulars of claims by December 18th, to the Trustee, Mr. W. G. Hall, National Provincial Chambers, Silver Street, Hull.

The Scottish Lighting Bureau.—We reproduce herewith a group photograph of some of those who attended the 10th Illumination Design Course at the Scottish Electric Lighting

A Group at the Scottish Lighting Bureau.

Service Bureau, Glasgow, from November 24th to 26th. Mr. Bush, of E.L.M.A., Mr. Langlands, chairman of the Lighting Service Bureau, and Mr. H. E. Hughes, the district engineer, are in the centre of the picture. The Bureau is doing splendid work and the lectures and demonstrations are being well attended.

New Italian Companies.—Among the new electricity supply undertakings recently formed in Italy are the following:—La Società Elettrica Salentina, Bari, capital 100,000 lire; La Società Elettrica Marosticense, Marostica, capital 500,000 lire; La Società Imprese Elettriche de Santa Lucia del Mela, capital 97,000 lire; La Società Distribuzioni ed Utilizzazione Energia Elettrica "Interanna," Terni, capital 500,000 lire; La Società Produzione Elettrica "Ape," Polizzi Generosa, capital 360,500 lire; and La Società Imprese Elettriche Siculo-Lombarde, Milan, capital 100,000 lire.

A new company has been formed in Rome with a capital of 100,000 lire and the title La Società Vettura Auto-elettriche Italiane to construct electric motor vehicles.

Indian Electrical Imports. — In the course of a report which he has recently submitted to the Department of Overseas Trade, Mr. T. M. Ainscough, O.B.E., Senior Trade Commissioner in India, states that the imports of electrical machinery into India during the six months from April to September were valued at Rs.96 lacs, as compared with Rs.98 lacs in the equivalent period of last year.

Book Notices.—"Memorandum of the Chief Engineer of the Steam Users' Association for the Year 1924." Manchester: Taylor, Garnett, Evans & Co., Ltd.—In this publication a detailed report is given of the proceedings of the deputation which interviewed the Home Secretary to lay before him the views of the Steam Users' and Kindred Associations, with regard to the boiler section of the 1924 Factory Bill. Considerable information is given regarding recent introductions of apparatus and methods and observations made in combustion practice. The Ljungström-Howden preheater is described. The results of much research by the Association are recorded, including experiments on strains in various boiler parts.

"Wireless Annual for Amateurs and Experimenters." Pp. xv+179; illustrated. London: Iliffe & Sons, Ltd. Price 2s. 6d. net.—In this issue the space formerly devoted to special articles has been curtailed in favour of matter to which amateur radio-telephonists constantly need to refer. The list of amateur transmitting stations in all parts of the world is, we believe, the first of its kind published, and is as up-to-date as possible. The tabulated lists of regular transmissions, both in Morse and telephony, are also valuable for reference, and the sixteen pages of typical receiver diagrams, with notes, and information regarding valve characteristics, finding and rectifying faults in receivers, data and tables have been compiled by well-known men. Articles on the work of the International Broadcasting Bureau and a comparison of the broadcasting regulations and conditions in different countries of the world are included, while the glossary of technical terms, the list of wireless societies, the classified directory of manufacturers, and other useful information contribute to make this publication a handy book of reference.

"Miscellaneous Publications of the U.S.A. Bureau of Standards." No. 64. Price, 15 cents; and No. 68. Price, 5 cents. —The latter is an illustrated pamphlet showing the correct adjustment for motor vehicle headlights.

Social Events.—Callender's Anchor Cable Works Operatic Society (Leigh) attracted crowded audiences to the local Hippodrome recently, when it produced with marked success the Gilbert and Sullivan fairy opera, "Iolanthe." The opening night was under the patronage of the Mayor and Mayoress, who sent their hearty congratulations to the principals, chorus and orchestra. On the following Friday night, when the house was packed with school children, the opera was preceded, as a token of respect to the memory of the late Queen Mother, by the singing of two verses of her favourite hymn, "Abide with Me," followed after one minute's silence by the National Anthem.

The Belfast branch of the General Electric Co., Ltd., recently held a supper-dance as a send-off to the Magnet Social Club which the staff has formed. Advantage was taken of the occasion to present a grandfather clock to the manager of the Irish branches, Mr. W. R. E. Boyd, while Mrs. Boyd was given a dressing set. The Lord Mayor of Belfast, with his wife and daughter, Mr. G. B. Hanna, M.P. Parliamentary Secretary of the Northern Ireland Ministry of Home Affairs, Mr. J. L. Dawson, manager of the Belfast branch, and Mr. Johnston Wright, the city electrical engineer, were present at the function.

A Cooking Inquiry.—The following is a copy of a letter received by Mr. R. B. Mitchell, engineer and manager of the Glasgow Corporation Electricity Department:—

Since electricity's so cheap;
And gas so very dear,
I wish to know what I should pay
To get the big gas stove away
And do our cooking here
By electricity. Please say
Good Mr. Engineer.

Unemployment.—The number of unemployed registered at the Employment Exchanges on November 30th was 1,165,100, a reduction of 9,445 on the week. The figure was also 25,154 lower than that of a year ago.

The Finnish Electrical Market.—According to *Commerce Reports*, the use of household appliances in Finland has been gradually developing, and it is expected to become a considerably more important market in the future, particularly in view of the Imatra hydro-electric scheme. Although the native electrical engineering industry is being fostered, the bulk of specialised apparatus, including domestic appliances, is imported. German appliances have the greatest sale, but there are many Swedish manufactures on the market.

New Zealand Preference for British Goods.—The *Board of Trade Journal* states that the new Customs regulations, which are to come into force on April 1st next, provide that the following classes of goods shall receive the benefit of the British preferential tariff on importation into New Zealand:—(a) Goods wholly Empire produced, (b) goods wholly Empire manufactured from Empire materials, (c) goods wholly Empire manufactured from unmanufactured raw materials and/or such partly-manufactured materials produced outside the Empire as are permissible. In the case of goods not fulfilling these conditions, preference will be granted where 50 per cent. of the factory cost of the goods is represented by Empire labour and/or materials, provided that the final process of manufacture is performed within the Empire.

A Stoker Contract.—Harrington travelling-grate stokers, constructed by Riley Stoker Co., Ltd., of London, have been adopted for the new power station at Kirkcaldy, designed by Messrs. Kennedy & Donkin, consulting engineers.

An E.D.A. Film Display.—The British Electrical Development Association is arranging an exhibition of films dealing with various aspects of electricity at Australia House, Strand, W.C.2, on December 18th, between 7.30 and 9.30 p.m. Tickets for the event may be obtained from the director and secretary of the Association.

The Czecho-Slovakian Electrical Industry.—The *Board of Trade Journal* for December 3rd published a summary of the proceedings at a recent meeting of the Czecho-Slovak Federation of Industries. It is stated that the electro-technical industry had expected the realisation of an extensive electrification scheme in Slovakia. The scheme was, however, only partly carried out, and Slovak firms therefore had to look for markets in Bohemia, Moravia and Silesia, but they were unable to compete with Czech firms owing to the high freight rates and higher cost of production in Slovakia. The tariffs imposed by neighbouring countries also allowed little export trade to be done, but in spite of those difficulties, the industry had a normal year. The cable industry had a satisfactory year owing to the large number of orders from sugar factories, and as soon as the Housing Law is enforced a further improvement is expected. On the other hand, the proposed erection of several new telephone exchanges in Slovakia did not materialise and slow progress is being made in this direction.

A Swiss Company's Thirty Years. — The Motor Columbus Gesellschaft, of Baden, which has assisted financially in the establishment of electric power stations in Switzerland and many foreign countries, recently celebrated the completion of 30 years' existence. The concern has now a capital of 60 million fr.

Russian Orders for Germany.—According to German statements attributed to the president of the Russian State Electrical Trust, the latter has entered into an agreement with the Berlin A.E.G. under which the German company has offered on a favourable credit basis to supply machinery and other electrical manufactures of the value of 15,000,000 roubles. Negotiations of a similar kind are said to be in progress with the Osram Gesellschaft. It is added that the Trust will shortly send a Commission to Germany, England, France, and the United States in order to negotiate concerning equipment of the value of 5,000,000 roubles. Another report, also from German sources, states that the Donetz Coal Trust, the Southern Steel Trust, and the Southern Ore Trust have commissioned the Soviet Trading Delegation in Berlin to purchase electrical and mechanical installations for the extension of the works of these trusts. In this connection it is said that an agreement has been entered into with the A.E.G., the Siemens concern, and Brown, Boveri & Co. under which a postponement of payment would be granted for a part of the deliveries for a period of three years. In the case of the supply of winding-engine equipment and transport installations, difficulty is stated to have arisen owing to the scarcity of capital in Germany; as a consequence these particular orders have not yet been allocated. Negotiations by the Soviet delegation with regard to the sinking of new pits in the Donetz basin, as well as for the construction of dwellings for the Steel Trust, are said to be still pending.

Credit Information.—The Federation of British Industries has decided to organise a credit information service with the aid and for the use of its members. The main intention of the scheme is to "curb the activities of the fraudulent debtor, the debtor who is unable to pay, and also those of the buyer who adopts sharp or immoral business practices." It is proposed to issue a weekly list to members who notify their intention of assisting the service, and in every case of the receipt of information the name of the member reporting will be confidential.

Turbine Tenders in Norway.—Particulars have now been published concerning the tenders received last year for the supply of two turbines for the State hydro-electric works at the Nore and for the delivery of two further turbines this year. Last year the Norwegian A.S. Kvaerner Brug quoted 1,077,520 kr. for one machine and 1,002,520 kr. for the second, the highest guaranteed efficiency at an average fall being 86 per cent. The Myren Verksted tendered at 1,162,000 kr. and 1,092,760 kr., respectively. On the other hand, the German firm, which secured the order for the two turbines, quoted 659,360 kr. per machine, with an efficiency of 87 per cent. This year the Kvaerner and Myren works, which obtained the order for the two turbines, submitted joint tenders at 770,000 kr. and 750,000 kr. for the two, respectively, with an efficiency of 88 per cent. The amount of the German tender was 612,880 kr. with an efficiency of 88.5 per cent.

Unjustifiable Pessimism.—Speaking at a luncheon to inaugurate a "Buy British Goods" week in Birmingham recently, the President of the Board of Trade said that a great deal of the pessimism prevalent was unjustifiable. In many directions trade was improving and British capacity, initiative, and ability would pull us through.

At the same luncheon, the Labour Lord Mayor of Birmingham protested strongly against the practice of municipalities in awarding contracts to foreign firms because their tenders were a little lower than those of British manufacturers.

For Sale.—The Superintending Engineer, Henlow Aerodrome, Beds., invites offers for surplus generating plant, &c., at Bircham Newton Aerodrome near King's Lynn. (See our advertisement pages to-day.)

New Czecho-Slovakian Company.—A new company has been formed in Reichenberg, with a capital of 200,000 crowns and the title Kontakta Gesellschaft, to manufacture electric carbons, contacts, and allied material.

New Belgian Company.—The Société Uranus d'Appareils Brevetés is the name of a new company which has lately been formed in Brussels, with a capital of 1¼ million fr.

The Ten-Penny Shilling.—At the annual meeting of the Decimal Association last week the following resolution was passed unanimously:—

That the Government be urged to divide the pound sterling into 20 shillings of 10 pence instead of 12, in order to secure many advantages simultaneously, including:—

(*a*) A lower cost of living through a general restoration of "pennyworth" and "halfpennyworth" of full pre-war value.
(*b*) A lower cost of producing goods through this lower cost of living.
(*c*) Increased efficiency in home and foreign trading operations through an extended use of cheaper office machinery.
(*d*) Increased facilities in foreign trading through the establishment of the decimal system as the universal basis of all the coinages used throughout the world.
(*e*) Improvement of the present British coinage by gradual evolution instead of by the more revolutionary proposals hitherto considered.

The ten-penny shilling proposal has been unanimously approved by the Executive Committee of the Federation of British Industries, and will come before the Council of the Federation next month.

A Chilean Transformer Contract.—The *Manchester Guardian* reports that Messrs. Ferranti, Ltd., have secured an important order from Santiago, Chile, in the face of keen competition from United States manufacturers who have a firm hold upon the market. The order comprises two 13,333-kVA, 3-phase, 110,000-V transformers and several smaller units for use in connection with the electrification of the Chilean State Railways.

The British Empire Exhibition.—The financial loss on the Exhibition has been provisionally put at £1,581,905, and guarantors will be called upon for 15s. in the £ of their guarantees. The cost to the State will be in the neighbourhood of £800,000.

Wireless Retailers.—The Wireless Retailers' Association is about to issue a Handbook of 100 pages relating to its activities and other matters of interest to retailers.

Lighting and Power Notes.

Adwick.—LIGHTING CHARGES.—At the request of the ratepayers the Council formulated an electricity scheme, on which a sum of £30,000 has been spent. Recently it was announced that the weekly charge for an unlimited supply of electricity was 1s. 6d. for five points per house and 1s. 7½d. for seven points per house. Residents intimated that unless the charge was reduced by half they would not take a supply. At a recent meeting of ratepayers it was stated that the Council was counting upon 60 per cent. of the 3,500 houses taking electricity to make the scheme self-supporting. The principal opposition was to an all-the-year-round charge, meters being preferred.

Beckenham.—LOAN.—The Town Council is applying for sanction to a loan of £10,000 for mains and services.

Birmingham.—ELECTRICITY SUPPLY RECORDS.—The output at the Corporation power station during the week ended November 27th was 6,288,000 kWh, which established a record, being nearly 20 per cent. more than in the corresponding week of last year, and considerably above the highest weekly output during the war period. On a recent foggy day the output was nearly 1,200,000 kWh, a record for one day.

Birkenhead.—ELECTRICITY IN BULK.—The Electricity Committee has received a report from the electrical engineer upon a provisional offer received from the Wallasey Corporation for an increased supply of electricity in bulk to Birkenhead. The Town Clerk of Wallasey is to be informed that the Committee is prepared to recommend the Council to accept the offer.

Blackpool.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £12,000 for a 2,000-kW turbo-generator.

Bolton.—LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow a further sum of £103,000 for plant extension and buildings at the Back of the Bank generating station.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical News*, the Algoma Power Co.'s plant at High Falls on the Michipicoten River has been purchased by the Chicago Edison Insull interests for a sum of $300,000. This plant comprises two units, one of 600 h.p., and one of 1,000 h.p. operating under an average head of 128 feet. The new interests will expend some $4,000,000 in the development of from 20,000 to 25,000 h.p., which will be available for the Goudreau and Michipicoten gold mining areas.

Work is reported to have started on a new paper mill costing $12,000,000 and a water power development costing $5,000,000 for the Canadian International Paper Co., Ltd., Three Rivers, Que. Both of these projects are on the Gatineau river.

Cheadle and Gatley.—LOAN.—The Urban District Council has applied for sanction to a loan of £3,280 for extending the mains to supply electricity to a new housing estate at Cheadle Hulme.

Colne.—"ASSISTED WIRING" SCHEME.—The borough electrical engineer has submitted a scheme to the Town Council in connection with the wiring of premises on the hire-purchase system. The scheme has been adopted by the Council and submitted for the approval of the Electricity Commissioners.

Continental.—SWEDEN.—It is reported that the proposal has been put forward for the formation of a company to supply electricity to the Island of Oland. It is proposed that power should be taken from the hydro-electric power stations on the mainland (probably Sydsvenska Kraft-A/B, Malmo) and transmitted by a h.p. submarine cable to Oland and further distributed to the different parts of the island by l.p. overhead lines.

BELGIUM.—Recently issued reports of the Société de l'Union des Centrales Electriques, of Brussels, state that good progress is being made with the linking up of the electricity supply undertakings in Belgium. The Union has now 24 sub-stations and nearly 80 miles of cables connecting up to 29 power stations belonging to 22 metallurgical, coal mining, tramway, and electricity supply undertakings. During the past year the exchange of electric power between distribution systems amounted to over 50 million kWh.

Criccieth. — ELECTRICITY SUPPLY. — The Urban District Council has notified the Gwynedd Trust of its intention to withdraw its support from the Trust's scheme for providing an electricity supply for the district, and to prepare an electricity scheme of its own.

Croydon.—MAINS EXTENSIONS.—The Electricity Committee has decided to extend mains at an estimated cost of £2,900.

Elland (Yorks.).—PURCHASE OF DOMESTIC APPLIANCES.—The Urban District Council has approved a proposal of the Electricity Committee to seek sanction to borrow £1,000 for the purchase of electric cookers, fires, &c., to be let out on hire.

Guernsey.—INAUGURATION OF SUB-STATION.—The new sub-station erected by the Guernsey Electric Light & Power Co. was formally inaugurated by Major-General the Hon. Charles Sackville-West, Lieut.-Governor of the island, on November 26th. Electricity is transmitted to the sub-station at a pressure of 6,000 V and reduced to 420 and 210 V d.c. for distribution.

Grimsby.—SUPPLY FOR "BEAM" STATION.—Upon the recommendation of the Electricity Committee, the Town Council has passed a resolution authorising the borrowing of £9,000 for the provision of cables and switchgear for supplying electricity to the "beam" wireless station, which the G.P.O. is constructing at Tetney.

Hastings.—INQUIRY.—Colonel T. E. Ekin, Inspector of the Electricity Commission, held an inquiry on November 24th and 25th into the application of the Corporation for a Special Order to supply electricity in various districts outside the borough, including Rye, Battle, and Ninfield. Mr. R. Harker, for the Corporation, stated that the Battle Urban District Council and the Hailsham and Battle Rural District Councils had given their consent to the proposed Order, and the borough of Rye had consented, subject to terms of an agreement. The Broomsgrove power station was capable of meeting the demands in the borough and Bexhill, leaving a substantial margin to be disposed of. Mr. R. Ferguson, the borough electrical engineer, stated that the capacity of the Broomsgrove station was 9,500 kW, and if further extension was required it would be possible to extend the system to 50,000 kW in an economical manner. He estimated the total supply to districts outside the borough at 702,869 kWh. Objections were raised to the scheme by the Hastings and St. Leonards Gas Co., the Southern Counties Electric Light & Power Supply Co., Ltd., the Commissioners of Sewers for the Rapes of Pevensey and Hastings, and Mr. P. Idle, for Mr. Bannister and 150 Hastings ratepayers. The Commissioners will give their decision in due course.

Helensburgh.—ELECTRICITY SUPPLY.—At the Dean of Guild Court the Clyde Valley Electric Power Co. was granted permission to erect a sub-station in connection with the town's electricity supply.

Hornsey.—The Housing Committee has recommended the wiring of 229 Council houses for electricity at a cost of £2,153. The following are the proposed weekly charges:—Nine points per house, 1s. 1d.; 8 points, 1s.; 7 points, 11d.; 6 points, 10d.

Irish Free State.—DUBLIN.—The Dublin Electricity Supply Bill has been further considered by the Free State Parliamentary Joint Committee, and it is announced that when the Committee's report has been presented it is the intention of the promoter, Sir John P. Griffiths, to hand the scheme over to the Free State Government free of cost.

WATERFORD.—The Corporation is taking steps to obtain a loan of £30,000 in connection with its electricity scheme. Of this amount £17,000 is estimated for providing mains, street lamps, services, and associated works, whilst the balance of £13,000 is for generating plant and accessories.

Lancaster.—ELECTRICITY IN BULK.—The Corporation has been in negotiation with the Carnforth Urban District Council regarding a supply of electricity to the district. The Electricity Committee proposes that for a bulk supply the Carnforth Council should pay £6 per annum per kW of maximum demand plus 1d. per kWh, together with 3½ per cent. per annum on the cost of the transmission line if erected by the Corporation; and that for a supply in detail the charges should not exceed 25 per cent. above the charges for the time being in force in Lancaster.

Leeds.—PROPOSED NEW POWER STATION.—The Corporation Electricity Committee is contemplating the erection of a new power station on the bank of the River Aire, where a site was acquired some time ago. The estimated cost of the work is £500,000, and the Committee is to approach the Electricity Commissioners for their sanction to the scheme.

London.—LEWISHAM.—The Board of Guardians has rejected a proposal to install its own generating plant and has decided to enter into a new agreement for seven years with the South Metropolitan Electric Light & Power Co., Ltd., for a supply at 1.25d. per kWh for the first 125,000 kWh, the charge to be reduced by a sliding scale to 1d. when the consumption reaches 250,000 kWh.

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY.—The Authority has established a Finance Committee, a Technical Development and Works Committee, and a General Purposes Committee, and has taken immediate steps to deal with questions referred to it under the statutes and the London Order regarding the establishment of the sliding scale of prices to be charged for electricity by the London Companies. It is hoped that the steps taken will enable the sliding scale to come into operation in January next in accordance with the desire expressed by the Electricity Commissioners. The Authority has also taken in hand the immediate consideration of applications for orders to supply in certain parts of the area and is giving special consideration to Parliamentary applications for the ensuing session.

Liskeard.—INAUGURATION OF SUPPLY.—The new power station of the Liskeard Gas and Electricity Co., Ltd., was formally inaugurated on December 1st by the Mayoress. The plant includes two 56/60-h.p. Vickers-Petters crude-oil engines, direct-coupled to two 36½-kW Crompton generators, with a D.P. battery of 470 ampere-hours capacity of 200 V. The scheme has been carried out under the supervision of Mr. H. Hill, consulting engineer and manager of the Bodmin Electric Light Co., and the total cost was approximately £6,000.

Lytham-St. Annes.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £3,000 for mains and other works in connection with the supplying of electricity to the Lytham Shipbuilding & Engineering Co., Ltd.

Manchester.—PROGRESS DURING OCTOBER.—During the month of Octobor the Corporation electricity undertaking showed an increase in connections of 1,926 kW, bringing the total to 271,628 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 1,190, representing a total of 3,543 kW. The number of consumers connected increased by 545, and the number of hired cookers connected by 81, bringing the total actually on circuit to 1,069. Applications for the hire of cookers totalled 118.

ELECTRICITY SUPPLY RECORDS.—On November 10th, the maximum supply demanded reached 129,230 kW and on November 20th the output reached 1,544,680 kWh, both figures creating records in the history of the undertaking.

LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £160,000 for mains.

Middlesbrough.—FIRE DAMAGE.—Referring to the fire at the North Tees power station reported in our last issue, it was at one time during its course feared that the switch house would be gutted, and early reports which we quoted stated that this had actually occurred. We understand, however, that the oil which became ignited was oil contained in one of the switch tanks; only 200 gallons of oil was involved, and the damage to the switch house was confined to the immediate vicinity of the fire. No oil was stored in any of the power station buildings. Only two out of the twenty Reyrolle metal-clad switches installed in the switch-house were damaged as a result of the fire; the whole of the switchgear (with the exception of the panels affected) was put back into commission soon after the fire was extinguished, and the power station was dealing with the normal load within eighteen hours of the commencement of the outbreak. Supply to a large number of local consumers affected was provided from the company's other sources of supply within a very short period.

Rawtenstall.—ELECTRICITY CHARGE.—At the last meeting of the Town Council it was reported that in response to an inquiry as to the price at which the Corporation would supply electricity to the type of house in which it was proposed that nothing but electricity should be used, for heating, cooking, domestic power and lighting, the Electricity Committee recommended a charge of 1d. per kWh, with a suitable minimum payment per annum. The matter is receiving further consideration.

Retford.—ELECTRICITY SCHEME.—It was reported to the Town Council on November 27th that draft specifications and form of tender for an electricity supply had been received and that it was hoped to proceed with the scheme at once. If, as is suggested, an electric drive is required at the town's sewage works at Bollam, and also for the waterworks, the lay-out of the whole scheme will be affected, including the size of the generating plant, which is to be set up at the gas works.

Reunion.—HYDRO-ELECTRIC DEVELOPMENT.—At a recent meeting of the French Institution of Civil Engineers, M. L. Guerin gave particulars of the hydro-electric plant which it is proposed to establish on the Island of Réunion in the Indian Ocean. It is estimated that by means of three plants water power to the extent of from 50,000 to 60,000 kW can be utilised, a large portion of which could be used for the production of synthetic nitrate which is largely used in Réunion and is at present imported from Chile.

Salvador. — ELECTRICITY SUPPLY. — Engineers from the United States are studying plans to harness the waters of Lakes Guija and Ilopango to provide power for an electric lighting system to supply all the towns of Salvador.—*Reuter's Trade Service* (San Salvador).

Sheffield.—ELECTRICITY EXTENSIONS.—The Electric Supply Committee has approved extensions and works at an estimated cost of £5,865, and extensions to mains for general distribution purposes at an estimated outlay of £11,584.

South Africa.—PAARL (CAPE PROVINCE).—A meeting of ratepayers of the Municipality has authorised the raising of a loan of £5,000 for the purpose of making alterations and extensions to the existing electricity supply undertaking, and the signing of a ten years' contract with the Electricity Supply Commission for the supply of electricity to Paarl, subject to the Council obtaining contracts from consumers for 980,000 kWh per annum. The supply to be given by the Commission will be taken from the new power station in course of erection near Cape Town.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Clacton Urban District Council to supply electricity in the parish of Little Holland; the Maidstone Corporation in parts of the rural districts of Maidstone, Malling, and Hollingbourn; and the Barrow-in-Furness Corporation in the urban district of Dalton-in-Furness and part of the rural district of Ulverston.

Application has been made by the Bridgend Urban District Council for a Special Order authorising it to supply electricity to certain parishes in the rural district of Penybont.

Tilmanstone.—ELECTRICITY EXTENSIONS.—The Tilmanstone (Kent) Collieries, Ltd., is to install plant with a capacity of at least 10,000 kW additional to its existing 2,000-kW station.

Torquay.—LOAN.—The Electricity Committee is applying for sanction to loans of £10,000 for mains and services, and £3,000 for renewals.

Ulverston. — INAUGURATION OF SUPPLY. — The electricity supply for the district was formally inaugurated on November 17th. Electricity is obtained in bulk from the Barrow Corporation.

Wrexham.—LOAN.—The Town Council has applied for sanction to a loan of £4,000 for an e.h.p. main, a low-pressure distributor, transformer, switchgear, and additions to buildings. The electrical engineer has been authorised to purchase electric cookers to be let out on hire.

York.—PRICE REDUCTIONS.—The Electricity Committee has recommended to the City Council that a reduction of the flat rate charge for lighting from 4¾d. to 4½d. per kWh be made, and that other charges be reduced 5 per cent., as from the September meter readings.

LOAN.—The Electricity Committee is seeking sanction to a loan of £15,000 for feeder cable extensions.

Tramway and Railway Notes.

Aberdeen.—SUBURBAN TRAMWAY PURCHASE.—According to the *Electric Railway and Tramway Journal*, a proposal to terminate the Town Council's present agreement with the Aberdeen Suburban Tramways Co. as to running powers in the city has been discussed by the Tramways Committee. A statement was submitted by the general manager, and it was agreed to recommend the Council to give six months' notice terminating the agreement. A letter was read from the Aberdeen Suburban Tramways Co. suggesting that the time might now be opportune for the Town Council to acquire the suburban tramways. The Committee decided to remit the letter to the Town Council for instructions.

Continental.—SWITZERLAND.—According to the 1926 budget of the Swiss Federal Railway Department, it is proposed during the coming year to increase the electric rolling stock by the addition of 155 locomotives and motor coaches. Contracts for 80 of the vehicles have already been placed.

Blackpool.—LOANS.—The Finance Committee has decided to apply for sanction to borrow £15,660 for the provision of 12 new tramcars, £8,268 for feeders and negative returns in connection with the Corporation Tramways Department, and £3,300 for the construction of an electric subway under the L.M. & S. Railway in the borough.

Halifax.—TRACK RENEWALS.—The Town Council has decided to apply to the Unemployment Grants Committee for assistance in connection with the proposed relaying of the tramway track from Tuel Lane Bottom in Wharf Street towards Halifax at an estimated cost of £2,295.

Heywood.—NEW ROUTE.—The Town Council has decided to co-operate with Middleton in the construction of a new tramway between Manchester Road, Heywood, and Hollins Lane, Middleton, to enable the Manchester Corporation, which will be granted a lease, to provide a through service of cars between Manchester and Heywood.

Liverpool.—PURCHASE OF UNDERTAKING.—The City Council, on December 2nd, approved of the acquisition by the Corporation of the Waterloo and Crosby tramways as from January 1st next. The proposed transfer provides that the Corporation, where practicable, shall lay forthwith and maintain a double track with a single or overlapping track where a double track is not practicable. The Corporation is to pay the district councils over a period of 21 years at the rate of £750 per annum until the land for widening is obtained, and afterwards at the rate of £1,100 a year. The fare under the Corporation management is not to exceed 2d. from Crosby to Seaforth with not fewer than three intermediate stages of 1d. each. These fares are to be maintained as long as the Liverpool fares are not increased. The number of passengers carried on the Waterloo and Crosby system in 1924 was 3,593,574 and the gross receipts amounted to £26,850, the expenditure £21,310, and the profit £5,540. It is estimated that there will be a saving in operating costs of nearly 3d. per car-mile, equal to £3,000 per annum, when the system is run by the Liverpool Corporation.

London.—NEW "UNDERGROUND" PLANT.—To meet the demand for the increased supply of energy which will be required for operating the new tube extension to Kennington and Morden, the Underground Company has taken steps to augment the existing plant of the Chelsea power station, and also at various points on the system. At Lots Road a third 15,000-kW turbo-alternator is being installed, and a fourth is on order. Two additional boilers, ten h.p. "group" switches, new circulating water strainers, oil filters, and two electrically-driven feed water pumps are also on order.

RECONSTRUCTION OF CHARING CROSS STATION.—A start is shortly to be made with the scheme for rebuilding Charing Cross underground station to enable it to deal with the increased volume of traffic which will arise when the Kennington extension opens next year. Contracts have been placed for the construction of the new subways and circulating area beneath the District Railway permanent-way and platforms. From this intermediate landing new escalators will lead down to the Hampstead platforms and also connect with the street. Contracts for this work have also been placed. The Charing Cross stations (District, Bakerloo and Hampstead) now cater for an annual traffic of 35,000,000 passengers. The new station will be capable of handling 50,000,000 passengers annually.

Salford.—THROUGH-RUNNING.—It was reported at a meeting of the Tramways Committee on December 1st that negotiations with the Bury Corporation for a service of through cars from Salford were approaching completion, and it was hoped that the service would be commenced about January 4th. The fare for the single journey will be 7d. It is intended that a reciprocal service shall be run by the Bury Tramways Committee to Salford.

South Africa.—RAILWAY ELECTRIFICATION.—A *Reuter* message from Cape Town states that it is hoped to complete the electrification of the 174 miles of railway from Glencoe to Maritzburg in Natal by March next. The electrification of the suburban lines in the Cape Peninsula, involving some 65 miles of track and comprising chiefly the Capetown-Simonstown line, is progressing, and it is hoped to have electric trains running in two years' time.

Telegraph and Telephone Notes.

Austria.—TELEGRAPH SERVICE.—The Government telegraph service recently introduced a system of "lightning messages" which are accepted for specially rapid transmission to any part of the country, also to Germany and Poland, at a charge nine times that of the ordinary rate. Another innovation is a reduced charge for telegrams containing over 60 words for transmission between stations provided with Hughes apparatus. On messages containing between 60 and 100 words a reduction of 20 per cent. on the ordinary rate is allowed; between 100 and 150 words, 30 per cent.; between 150 and 200, 40 per cent.; and over 200 words, 50 per cent.

Australia.—TELEPHONE SERVICE.—A speech by the Postmaster-General, in which Mr. Gibson reviewed the operations of his department, seems to show that normal conditions appear to have been reached with regard to telephone arrears; 5,000 new services are being added per month. In placing orders for supplies full advantage has been taken of opportunities offering to encourage Australian industries. Australian firms now are manufacturing nearly the whole of the wire and lead-covered cable used, to the value of £600,000 a year, and when to this is added the expenditure on such other commodities as insulators and conduit the annual amount expended by the department on local supplies is in excess of £1,000,000. The development of the telephone service has been marked in country districts, where the rate of increase is now higher than in the metropolitan areas.

Canada.—TELEPHONE SERVICE.—At the last census (1921) there were 11 telephones to every 100 of the population; the gross annual revenue per telephone (including all long-distance tolls and other charges) was £8 12s., compared with £9 13s. in the United States, and slightly above £10 in the United Kingdom. The actual cost for a private telephone installed in a residence is 11s. per month with unlimited calls. In the Prairie Provinces there are two rural telephones for every one urban.—*Reuter* (Ottawa).

At the beginning of the present year there were 1,083,964 telephones in Canada, as compared with 1,022,782 at the beginning of 1924. Next to the United States, Canada has the largest number of telephones in use *per capita*—one telephone to every nine inhabitants, as compared with England's one to thirty-seven.

China.—NEW RADIO STATION.—The Shansi authorities are constructing a wireless station at Hou Hsiao Ho Taiyuan, Shansi provincial capital. A number of experts and skilled mechanics have been engaged from Peking to carry out the work.

LONG-DISTANCE TELEPHONY.—A long-distance telephone service between Kalgan and Suiyuan, which had been under construction since last winter, was recently completed, and according to General Wu Te-ching, chief military engineer for the North-eastern Army and Manager of the Chinese Telegraph Administration at Shanghai, work was to commence on October 15th on the first long-distance telephone service in this part of China, connecting Shanghai and Nanking and also bringing within speaking range of Shanghai the cities of Soochow, Wusih, Shangchow, &c. It is hoped to have the line completed by January 1st, 1926. Another long-distance line stretching from Nanking to Tsinanfu, *via* Tientsin, was to be started simultaneously. The total cost of the lines from Shanghai to Nanking and from Nanking to Tsinanfu will be approximately $300,000. The rates charged for using the service will probably be $3.50 for five minutes' conversation between Shanghai and Nanking, $8 between Shanghai and Tientsin, and $4 between Tientsin and Mukden.

Marine Radio Operators.—STRIKE.—Representatives of several trade unions were present at a meeting of the Seafarers' Joint Council which was held last week in London to consider the strike of marine wireless operators. It is understood that the Wireless Operators' Union brought forward a resolution which the National Sailors' and Firemen's Union objected to and refused to discuss business until it had been withdrawn. The meeting was accordingly suspended.

The President of the Board of Trade informed the House of Commons that returns from the principal ports showed that up to December 4th (evening) 25 passenger ships and 124 cargo vessels had sailed without radio-telegraphists. Passengers had been warned of the suspension of the regulations requiring ships to carry operators.

Shetland-Iceland Cable.—CONCESSION RENEWED.—It is announced by the *Financial News* that the Great Northern Telegraph Co.'s concession for a cable from the Shetland Islands to the Faroe Islands and Iceland has been renewed, subject to the approval of the Icelandic Alting.

South Africa.—TELEGRAPH AND TELEPHONE DEVELOPMENT.—Mr. Thomas Boydell, Union Minister of Posts and Telegraphs, recently stated that since the present Government took office in June, 1924, nearly 10,000 miles have been added to the country's telegraph and telephone facilities, which fact, says the *British S.A. Export Gazette*, ought to impress upon British manufacturers the importance of the Government business likely to be on offer shortly in this connection. Official purchases of telephone and telegraph equipment in 1925 reached a higher figure than the £265,685 recorded in 1924, which was in its turn an advance on the £122,201 registered in 1923, and an effort is being made to add 3,000 miles to the farm telephone service before the end of the financial year in March. In 1924 British firms handled contracts to the value of £205,314 out of a total of £265,685, but both Swedish and German efforts to participate to a greater extent than formerly are very evident. There would appear to be little danger of Britain losing considerable ground, however, says the *Gazette*.

The Telephone Service.—DUTCH CABLE REPAIRED.—The submarine telephone cable to Holland, which broke about 10 miles from Aldeburgh (Suffolk) on November 17th, has been repaired. In spite of rough weather and heavy seas, the cable ship was able to find both ends of the broken line, and on December 3rd the eight telephone circuits contained in this cable were again available for use.

FIRE CALLS.—Statistics supplied by the London Fire Brigade show that out of 7,478 calls received in the London area, no fewer than 1,800, or over 24 per cent., were received through subscribers' or call-office telephones, which figures indicate the increasing use of the telephone for firm-alarm purposes, notwithstanding the fact that there are now 1,700 street fire alarms throughout the London Fire Brigade area.

Radio Notes.

Australia.—LICENCES.—According to the Postmaster-General, by the end of the first year of broadcasting operations, *i.e.*, August, 1925, nearly 70,000 listeners' licences had been issued, while for the year ended June 30th last the revenue amounted to £118,909.

Canada.—LICENCES.—The number of amateur wireless receiving licences issued for the nine months of the current year ended September 30th showed an increase of 7,823 over the previous year, making a total in use of 64,682. Ontario issued half the licences with a total of 32,833. The cost of each licence is one dollar per annum.—*Reuter* (Ottawa).

EDUCATIONAL.—A "University of the Air" is to be established by the Manitoba Agricultural College, in conjunction with the Manitoba telephone system broadcasting station at Winnipeg. According to Prof. Clark Hopper, a series of diploma courses will be instituted by the college, all instruction being given by wireless. Examinations will also be conducted by radio, and students who are successful will be given diplomas.

Daventry.—AERIAL MISHAPS.—The recent severe frost coated the aerial of the B.B. Co.'s high-power station (5 XX) with ice, the weight of which brought down some of the wires in the early hours of Saturday morning, December 5th. Temporary repairs were made, but during the night a further breakdown occurred; until repairs have been completed, the service will be maintained at reduced power.

European Wave-lengths.—OFFICIAL VIEW.—It is considered (by the *Radio Times*) undesirable that listeners should hold hopes of an improvement which has no possibility of being fulfilled for some time to come. Rather they should know definitely that the existing state of affairs must unfortunately continue during the present winter. No scheme satisfactory to all who must participate in it has been yet devised by which room can be found for 150 broadcasting stations in a wave-band which can only properly accommodate 100 stations. New proposals are being drafted, but they cannot be put into immediate operation. For the time being, therefore, no general alteration will be made in the wave-lengths of European broadcasting stations. Jamming between one station and another must get worse before it can become better.

BRUSSELS CONFERENCE.—The Co-ordination Committee of the Council of the International Radio-phony Union, assisted by engineers, will meet in Brussels on December 14th, when several plans for stabilising the European wave-length situation will be discussed, says the *Daily Mail*, which points out that the scheme drawn up at the last conference of experts, while excellent in theory, has proved entirely unsatisfactory in practice. At present one of the worst culprits is Toulouse, which on one occasion recently was found to have changed its wave-length six times in 24 hours.

Germany.—NEW STATION.—Frankfurt is erecting a new high-power broadcasting station which will be ready in February. This 10-kW station, says *The Times*, will be a considerable improvement on the present station, which is accommodated in the Post Office buildings. Frankfurt has at present 65,000 listeners, and arrangements were recently made to put crystal users in touch with foreign stations, which scheme has given much satisfaction.

RESTRICTION REMOVED.—The removal of restrictions on reception in occupied territory will give a new impulse to the radio industry in that district. The Post Office has not yet published an official statement, and doubt appears to exist as to the interpretation of the exemption. The ordinance of the Rhineland Commission of November 20th refers to the removal of restrictions on "wireless telegraphic receiving instruments." Listeners will be obliged to notify the police, who will have to supply a list of the names of users to the military authorities. Stations for broadcasting within the occupied zones continue to be prohibited.

India.—BROADCASTING COMPANY.—Last summer it was announced that applications for permits to establish a broadcasting company for India, together with applications for a separate company for Burma, would be received up to August 31st by the Director-General of Posts and Telegraphs, Wireless Branch. At the request of interested parties the last day for tendering was postponed to December 7th. There is reason to believe that tendering was confined to interests associated with the Indian Radio Telegraph Co., Ltd., which some time ago took over the Marconi interests in India, says *The Times*. The receiving licence is to cost not Rs.15 per annum, as at first suggested, but Rs. 10. Consequently the percentage payable to the broadcasting company has been raised to 15 per cent. Various suggestions have been made as to meeting the claim of the promoters that they should be permitted to create a second source of revenue in addition to the percentage, and it is now announced that applications will be considered which provide for the payment to the company, by importers, of a royalty on imported wireless apparatus. The duty on such apparatus was fixed some time ago at 2½ per cent., as compared with a general import rate of 15 per cent. Another question as to which negotiations have been taking place is the extent to which the broadcasting programme may be utilised for the publication of Government announcements and *communiqués*. Mr. McCarthy Jones has been selected to be the general manager of the Indian Radio Telegraph Co., Ltd., and is proceeding to India to take up his duties.

Italy.—NEW STATION.—The new broadcasting station at Milan was inaugurated on December 9th; it will work on a wave length of 320 metres for the time being.

The *Morning Post* draws attention to modifications recently introduced in the law controlling radio in Italy. Owners of receiving sets may pay the annual fee for the licence in monthly instalments of 8 lire (about 1s. 4d.), and where sets are installed in public places, or for purposes of gain, special contracts will have to be made with the broadcasting companies. Manufacturers of receiving apparatus must obtain from the Ministry of Communications a special permit, which costs 500 lire annually.

Radio material is to be taxed; for example, the tax on every valve will amount to 6 lire, on every crystal set 12 lire, on every loud-speaker 24 lire, and on every receiving set having one or more valves 36 lire, in addition to the tax on the parts already mentioned, the amounts being added to the buyer's invoice at the time of purchase. Ten per cent. of the taxation receipts go to the State, and 90 per cent. to the broadcasting company. Those who do not comply with the law are, in addition to the penalties laid down in the Penal Code, liable to fines of from 1,000 to 2,000 lire for all violations committed by manufacturers, merchants, and shopkeepers, and 200 lire where receiving sets are kept without a licence.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Aberdeen.—December 16th. National Committee for the Training of Teachers. Electrical work in connection with two hostels and subsidiary buildings at Kittybrewster, Aberdeen. Specifications from Mr. J. A. O. Allan, architect, 25, Union Terrace, Aberdeen.

Ashford.—December 14th. Electricity Department. Concrete engine foundations, concrete cooling pond, reinforced concrete road, steam and small electric circulating water pump, fuel-oil pump, oil-purifying plant, fuel-oil storage tanks, &c. (November 27th.)

Australia.—MELBOURNE.—April 12th, 1926. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. (See this issue.)

Victorian State Railways. January 20th, 1926. Automatic battery-charging equipment.* January 13th. Double recording wattmeter.*

Banff.—December 14th. Town Council. Electrical work in connection with the new Town Hall. Specifications from Town Clerk.

Belgium.—December 30th. Belgian Ministry of National Defence, 10, Rue du Méridien, Brussels. Wireless telegraph apparatus for use on military aeroplanes. Particulars (Cahier des Charges Special, No. 636) for 4 fr., from 15, Rue des Augustins, Brussels.

Prentwood.—January 1st. Guardians of Billericay Union. Electrical wiring in conduit and installation of complete electric generating plant at the Institution, Billericay. (See this issue.)

Edinburgh.—December 14th. District Board of Control. Electrical and heating work at Bangour Mental Hospital new X-ray building. Specifications from Mr. J. D. Gibson, surveyor, 60, Frederick Street, Edinburgh.

January 4th, 1926 Electricity Supply. Two 1,200-b.h.p., 6,600-V, 3-ph. induction motors. (See this issue.)

Edmonton.—Education Committee. Wiring offices at Brettenham Road, Edmonton, for electric light. (See this issue.)

Folkestone.—Electric lighting and telephone installation at the Leas Cliff Hall. (See this issue.)

Leamington Spa.—December 17th. Corporation. Installation of electric light, electric bells, and wiring of motors at the Royal Pump Rooms. (See this issue.)

London.—ISLINGTON.—December 17th. Electricity Committee. One 75-kW a.c. motor and d.c. generator, with starters, switchgear, &c., and three 5,000-kVA Scott-connected transformers, &c. (November 20th.)

H.M. OFFICE OF WORKS.—December 18th. Electric wiring in conduit of the Western Annexe, &c., at the British Museum. (December 4th.

LONDON COUNTY COUNCIL.—December 31st. Renewal of the storage battery at Bexley Mental Hospital. (See this issue.)

Manchester.—December 30th. Electricity Committee. One single unit (or, alternatively, one double unit) three-phase induction regulator. (See this issue.)

New Zealand.—WELLINGTON.—February 16th. Outdoor switchgear for the Waikato electric power scheme.*
February 16th. Outdoor switchgear for the Waikato electric power scheme.*

AUCKLAND.—February 8th. Auckland Electric Power Board. Overhead cotton-covered triple-braided cable.*
February 22nd. 15-amp. cut-outs.*

Preston.—January 15th. Electricity Department. Supply and erection of approximately 15 miles of 33,000/45,000 V double transmission lines. (See this issue.)

South Africa.—JOHANNESBURG.—January 28th, 1926. S.A. Railways and Harbours. Eleven 4-ton electrically-driven wharf jib cranes and seven electric capstans for Durban Harbour. Secretary to the Tender Board, S.A.R. Headquarters, Johannesburg.*

UNION TENDER BOARD.—January 28th. Miscellaneous telegraph and telephone materials for the Department of Posts and Telegraphs.*

Uruguay.—February 23rd, 1926. State Electricity Supply Works. Porcelain insulators and accessories.*
D.c. and a.c. meters.*

Wakefield.—Installation of electric lighting at Outwood Council School, Stanley, near Wakefield. P. Beaumont, West Riding County Council Education Offices, 8, St. John's North, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Accrington.—Electricity Committee. Accepted:—
Two years' supply of cable.—W. T. Glover & Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—
220 yd. low-pressure 4-core cable (£344).—Macintosh Cable Co., Ltd.

Bradford.—Tramways Committee. Accepted:—
Eight miles round copper trolley wire (£800).—Collier Bros. (agents for Thos. Bolton & Sons, Ltd.).
New No. 5 model 45-h.p. engine for motor tower wagon (£220).—Associated Equipment Co., Ltd.

Hornsey.—Electricity Committee. Recommended:—
Turbo-generator and condensing plant (£16,520); air filter (£213); Lea recorder (£210).—Brush Electrical Engineering Co., Ltd.

Hull.—Tramways Committee. Accepted:—
500 tons rails, 12 tons fishplates, and 7½ tons of sole plates (£6,037).—Bolckow, Vaughan & Co., Ltd.

Telephones Committee. Accepted:—
Bronze wire (£369); cable (£66).—W. F. Dennis & Co., Ltd.
Lead-in wire (£147).—London Electric Wire Co.
Switchboards (£190).—British L. M. Ericsson Manufacturing Co., Ltd.
Cable (£66).—W. F. Dennis & Co., Ltd.

The City Council, on Thursday last week, confirmed the recommendation of the Telephones Committee accepting tenders for German-made cable and wire. An amendment was moved that the lowest British tender should be accepted, and in the discussion a statement was made that the Hull Board of Guardians was paying £400 per week additional relief this year in consequence of unemployment. The reply was that it was ridiculous to argue that we should not trade with other countries. We must buy in the cheapest market and stimulate international trading.—*Manchester Guardian.*

Kilmarnock.—Ayrshire Education Committee. Accepted:
Installing electric light at a new special school.—William Johnstone and Son.

Leeds.—Waterworks Committee. Accepted:—
Electric motor and pump at Moortown reservoir (£208).—Mather and Platt, Ltd.

Tramways Committee. Accepted:—
150 electric equipments for new rolling stock (£85,000).—Metropolitan-Vickers Electrical Co., Ltd.

Electricity Committee. Accepted:—
Cable.—£2,748, W. T. Henley's Telegraph Works Co., Ltd.; £1,560, Macintosh Cable Co., Ltd.; and £1,095, Enfield Cable Works, Ltd.

Liverpool.—Tramways Committee. Accepted:—
New tramway works and car depôt in Edge Lane (£243,623).—W. Moss and Sons, Ltd.

London.—POPLAR.—L.C.C. Education Committee. Electric lighting at George Green school:—

A. Hawkins & Sons (Recommended)	**£559**
Malcolm & Allen, Ltd.	594
Commercial Telephone and Electrical Co., Ltd.	629
Star Electrical Co.	640
J. G. Sneath	698

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON.—Additional plant for Lots Road power station.—According to *Modern Transport*, the third 15,000-kW turbo-alternator is being installed, whilst a fourth is on order. Main contractors for the turbines, C. A. Parsons & Co., Ltd.; sub-contractors for the alternators, Metropolitan-Vickers Electrical Co., Ltd.; condensers, W. H. Allen, Son & Co., Ltd.

HAMMERSMITH.—Electricity Committee. Accepted:—
Installation of reactors between the two- and three-phase switchboards (£465).—British Thomson-Houston Co., Ltd.

ADMIRALTY.—Accepted:—
Six Yarrow patent water-tube boilers (land type) with Yarrow superheaters for Portsmouth electric power station.—Yarrow & Co. (1922), Ltd.

Manchester.—Tramways Committee. Accepted:—
Copper trolley wire.—F. Smith & Co., incorporated in the London Electric Wire Co. & Smiths, Ltd.
Bronze trolley wire.—Elliott's Metal Co., Ltd.
Cadmium trolley wire.—Rd. Johnson & Nephew, Ltd.

Education Committee. Accepted:—
Rearrangement of electric lighting at Bangor Street school.—Ward and Booth; at Grange Street school.—Lancaster & Bowen, Ltd.

Electricity Committee. Accepted:—
Cable.—Johnson & Phillips, Ltd.

Oldham.—Electricity Committee. Accepted:—
Construction and erection of a new cable bridge across the railway at Greenhill.—Babcock & Wilcox, Ltd.

South Africa.—BULAWAYO, RHODESIA.—Municipality. Accepted:—
Three B. & W. 10,000-lb. boilers, with mechanical stokers, superheaters, and economisers, £14,000; two Belliss-Witton (G.E.C.) turbo-alternators, condensing plant and auxiliaries and engine room steel work, £13,130; one Yarway spray cooling plant, complete, £1,100; steam and auxiliary piping, including Cope's regulators for boilers, £2,000.—Reunert & Lenz, Ltd.
One Johnson & Phillips eleven-panel truck-type switchboard, complete (£1,328).—Bartle & Co.—*S.A. Mining and Engineering Journal.*

Spain.—MADRID.—Babcock & Wilcox (Spain) has obtained the order for eight electric cranes for the port works on the Guadalquivir.—*Reuter's Trade Service* (Madrid).

York.—Electricity Committee. Recommended:—
6,000-kW turbo-alternator, &c. (£18,998).—Oerlikon, Ltd.
Switchgear (£680).—Metropolitan-Vickers Electrical Co., Ltd.

According to the *Yorkshire Post*, it was stated at a meeting of the City Council that thirty tenders had been received from British, Swiss, French, Dutch, and Belgian firms. The lowest English tender was something over £24,000. Much of the material under the Oerlikon contract would be made in England; less than £7,000 would be spent in Switzerland. During a discussion the referring-back of the Electricity Committee's recommendation was proposed and defeated. A member of the Council said that the high rate of British tenders were due to the operation of "rings."

Forthcoming Events.

Institution of Mechanical Engineers.—Friday, December 11th. At the Institution, Storey's Gate, S.W. At 6 p.m. Papers on "Foundry Practice," by Mr. J. G. Pearce; and "Some Applications of Research to Modern Foundry Practice," by Mr. J. E. Fletcher.

Nottingham Society of Engineers.—Monday, December 14th. At the Victoria Station Hotel. At 7.30 p.m. Papers on "Buying of Second-hand Machinery," by Mr. M. A. Crosbie; on "Electric Vehicles," by Mr. A. O. Fawcett; on "Electricity *v.* Gas," by Mr. E. Mellon; on "Electric Welding as Applied to Boiler Repairs," by Mr. F. G. Skerritt; and on "Engineering in the Fire Service," by Chief Inspector Stokes.

Institution of Civil Engineers.—Tuesday, December 15th. At the Institution, Great George Street, S.W. At 6 p.m. Paper on a "Pressure-boosting Station for the Waterworks of the City of Montevideo," by Mr. A. Honeysett.

Society of Technical Engineers.—Wednesday, December 16th. At the Queen's Hotel, Birmingham. At 7.30 p.m. Lecture on "Some Present-day Needs of the Electrical Industry," by Mr. A. G. Ellis.

Edinburgh Electrical Society.—Wednesday, December 16th. At the Royal Scottish Society of Art, 117, George Street. At 8 p.m. Paper on "Radio-Telephony and Broadcast Receivers," by Mr. F. Boyd.

Radio Society of Great Britain.—Wednesday, December 16th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 6 p.m. Annual general meeting. Paper, "Some Facts and Notions About Short Waves," by Mr. D. Sinclair.

Paisley Association of Engineers.—Tuesday, December 15th. At 16, High Street, Paisley. At 7.30 p.m. Paper on "Motor Breakdowns: Their Causes and Rectification," by Mr. T. T. D. Geesin.

Institution of Electrical Engineers.—Thursday, December 17th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "The Power Losses in Magnetic Sheet Material at High Flux Densities," by Mr. C. E. Webb.

(Mersey and North Wales (Liverpool) Centre).—Monday, December 14th. At The University, Liverpool. At 7 p.m. Paper on "Post Office Wireless Stations," by Mr. E. H. Shaughnessey.

(North-Eastern Centre).—Monday, December 14th. At the Armstrong College, Newcastle-on-Tyne. At 7 p.m. Paper on "Recent Improvements in the Insulation of Electrical Machinery," by Lt.-Col. K. G. Maxwell and Mr. A. Monkhouse.

(North-Western Centre).—Tuesday, December 15th. At the Engineers' Club, Manchester. At 7 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(London Students' Section).—Wednesday, December 16th. Second annual dance.

(Sheffield Sub-Centre).—Wednesday, December 16th. At the Royal Victoria Hotel, Sheffield. At 7.30 p.m. Informal evening discussion on "Engineering Difficulties and How They Were Surmounted."

Birmingham Electric Club.—Friday, December 18th. At the Grand Hotel, Colmore Row, Birmingham. At 7 p.m. Annual meeting.

British Electrical Development Association.—Friday, December 18th. At Australia House, Strand. Display of electrical films.

Junior Institution of Engineers.—Friday, December 18th. At E.L.M.A. Lighting Service Bureau, 15, Savoy Hill, Strand, W.C. At 7 p.m. Lecture on and demonstration of industrial and domestic electric lighting.

Manchester Electro-Harmonic Society.—Friday, December 18th. At the Albion Hotel, Piccadilly, Manchester. Smoking concert.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—
Heating moulds for bowler hat making.
A wooden lampholder adaptor, the top of which has two holes drilled to permit of flexible leads being taken out.
STAR signalling instruments.
Also we have an inquiry for the present address of Messrs. H. W. Butler & Co., late of Great Ormond Street.

Notes.

"Unchokeable" Ash Pumps.—In connection with the recent description of the St. Marylebone electricity generating plant, we have been asked to point out that Messrs. Blackstone and Co., Ltd., are the sole manufacturers of the "unchokeable" ash pumps used in that station, each of which is capable of handling 70 tons of ash per hour.

The Whitworth Society.—The third annual commemoration dinner in memory of Sir Joseph Whitworth will be held at 6.30 for 7 p.m. on Monday, December 21st, at the Holborn Restaurant, Kingsway, London, Mr. Wm. Sisson, president, in the chair. Further particulars can be had from the Hon. Secretary, Whitworth Society, Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1.

Diesel-Electric Railway Traction.—The success of the new British light Diesel engine, specially designed by Messrs. William Beardmore & Co., Ltd., and built in one of their Glasgow works, for the oil-electric cars recently introduced on the Canadian National Railways, some details of which will be found on p. 665 of our October 23rd issue, is attracting interest amongst railway engineers. The general problem to be solved was that of reducing operating costs on lines where the low density of traffic does not justify steam traction, and puts electrification out of the question owing to the capital outlay involved. It is generally felt that by putting into commission a nucleus of nine cars—two of which are already in service — the Canadian National Railway has taken an important step towards its solution.

At the luncheon during the trial trip of the first articulated car between Montreal and Ottawa, Mr. C. E. Brooks, chief of the Motive Power Department, C.N.R., outlined a trip he made to Sweden and Great Britain to examine the possibilities of adapting oil-burning engines of the Diesel type to railway practice in Canada. Such engines were in use in Sweden, but the space they occupied and their weight in relation to their power-producing qualities were far too great to adapt them to service in Canada. He found in the light aero engine in the Beardmore plant at Glasgow the basis for the engine which had been installed in the articulated car. "The nearest approach to this engine," he continued, "weighs from three to four times as much per horse power. Its possibilities are great, provided we can maintain it reasonably. The fuel cost is much lower than our expectation. We felt that if we could operate the small car at between 4 and 5 cents a mile for fuel, we would be satisfied. We have found that we are able to operate it at under two cents a mile for fuel and, in some cases, we have come very close to one cent. Our tests have proved that it compares very favourably with any other form of transportation."

The special features in favour of the oil-electric type of car are low cost of fuel oil, lubricating oil, and engine maintenance, uniform acceleration, elimination of the roughness of operation and high maintenance cost of heavy mechanical transmissions, facility of control from either end of the car, and operation of the engine under its most economical conditions by maintaining a constant load throughout a large variation in car speed. The accompanying illustration shows a 160-b.h.p. engine and generator on test in the makers' Glasgow works; it is fitted in the smaller type of car, which carries 56 passengers and luggage.

Further particulars of the feat of the new oil-electric car, which crossed Canada from Montreal to Vancouver in 67 hours, show that two world's "records" were achieved, one for the fastest run for such a distance (2,937 miles), and the other for the longest non-stop run ever made. The car left Montreal 16 hours after the C.N.R. fast "Continental Limited," passed it at Winnipeg, and arrived in Vancouver 22 hours ahead of it, the steepest grades of the Rockies being climbed at an average speed of 40 m.p.h. From the time the car left Montreal until it reached Vancouver the engine never stopped running.

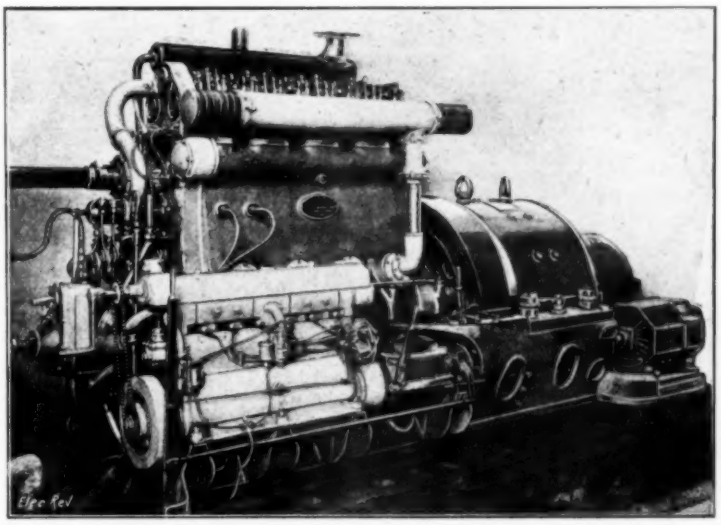
According to *The Times*, five of the principal trunk line railways entering New York City have ordered oil-electric locomotives to displace the coal-burning locomotives. In a recent test of fuel and lubrication, the cost of the steam locomotive showed itself to be more than six times the cost of the oil-electric locomotive, which is operated as an internal-combustion engine using low-grade fuel oil. It is calculated that if all trunk lines employ oil-electric locomotives the railways' annual fuel bill can be reduced by $375,000,000 per annum.

Agricultural Hall Lighting.—CORRECTION.—In our November 27th issue, in a note headed "The Public Works and Roads Exhibition," reference was made to the re-lighting of the Agricultural Hall and in connection with the new installation the title of the Engineering & Lighting Equipment Co., Ltd., of St. Albans, was given in error. We apologise for the accidental omission of the words "Engineering &."

Electrical Power Engineers' Association.—ANNUAL DINNER.—The third annual dinner of the West Yorkshire Section of the Electrical Power Engineers' Association took place at the Great Northern Hotel, Leeds, on Saturday, December 5th. The chair was taken by Mr. A. J. S. Waddell, of Bradford, who, together with Mrs. Waddell, had held a reception of the guests, numbering over 150.

After the loyal toast, Councillor J. W. LONGLEY, chairman of the Bradford Corporation Electricity Committee, in proposing "The Association," said the E.P.E.A. was a body which he believed everybody in the electrical world appreciated. Bradford valued very much the help rendered by it in the difficult times through which they had to pass in that city. Members of such an Association could either make or mar the electricity industry, or the undertakings with which they were connected, and it was a pleasure to be able to state that in every respect its members appeared to feel themselves a part of such undertakings. The Association had spent some considerable time in drawing up a scheme for the training of apprentices. Everybody was agreed that nothing was more necessary than that apprentices should be given the finest and most thorough training possible, not only in the electrical world, but also the mechanical world.

Mr. A. L. LUNN, of Manchester, responded, and said they all felt proud of their Association. It was a fact that the members were more prosperous to-day owing to the efforts of the E.P.E.A., which had given them a standard of living more commensurate with their responsibilities. With regard to the training scheme, they all knew the rather hopeless way in which men had been trained in power stations in the past and that must never be repeated.



Diesel-Electric Railway Traction Plant.

The toast of "The National and District Joint Boards" was proposed by Mr. THOMAS ROLES, electrical engineer and manager to the City of Bradford, who said that in Bradford they were very pleased that such Boards and the E.P.E.A. were in existence. No industry could expect to progress unless it could attract the right kind of man; and if only for the fact that the Association had been instrumental in raising the standard it had surely proved its worth.

In responding, Alderman WALKER, of Manchester, chairman of the National Joint Board, said that the Joint Boards had been able to bring about a scale of salaries which had proved acceptable to all parties, and after five or six years' working had gained the confidence and respect of both the employers and employed. If an adequate salary was paid, the right man would be obtained; low salaries resulted in a low level of service. With regard to the training scheme, it was essential that the training should be an all-round one to enable the lads to pass the A.M.I.E.E. examination, or its equivalent. A ground training in the power station or on the mains was not sufficient. Training in the general work of the undertaking should be given, together with an insight into the business organisation and the system of arriving at costs.

Mr. H. P. WADSWORTH, of Huddersfield, proposed "The Guests," and coupled with the toast the Press.

A musical programme, given by a party from Huddersfield, added to the pleasure of the proceedings.

Visit to Electricity Works. — Members of the Lancaster Chamber of Trade paid a visit to the Caton Road electricity works of the Lancaster Corporation on December 2nd, and the following night heard a lecture by Major G. C. Milnes, on "Electricity, its Production, Distribution, and Costing," in the Town Hall.

Appointments Vacant.—Boiler-house assistant engineer (£349) for the Kingston-upon-Hull electricity department; mains assistant (£156), for the Southport Corporation electricity department; plumber-jointer, for Ashford (Kent) U.D.C. electricity department; telegraph foremen (£400), cable jointer (£425), for the Government of the Gold Coast. (See our advertisement pages to-day.)

Local Societies.—On December 2nd, the Edinburgh Electrical Society paid a visit to the Department of Engineering, University of Edinburgh. A brief account of the buildings and equipment, illustrated by lantern slides, was first given by Prof. Hudson Beare, M.Inst.C.E., after which a tour was made through the various laboratories, the workshops, and the drawing office. Various tests and demonstrations were witnessed by the party, including steel bar tension and cement briquette tensile tests, and other tests on water wheels and turbines, &c.

A Turbine Wrecked on the Rand.—As we go to press it is reported in the daily papers that an explosion occurred at the Vereeniging power station of the Victoria Falls & Transvaal Power Co. on December 8th. The shaft of one of the A.E.G. (German) 10,000-kW turbine-driven generators broke, and the machine was wrecked, parts flying through the roof and in other directions. The other three generating sets were damaged, but it was hoped that they would be quickly set at work again. Fortunately no one was hurt. As all the stations of the company, of 216,000 kVA aggregate capacity, were fully loaded, the supply to the Rand mines was curtailed in the central area.

Electrical Association for Women.—The new Glasgow and District Branch at its first meeting enrolled over 50 members, and the Committee has already drawn up its first programme of activities, which include a visit to the Dalmarnock Power Station and a lecture on "Home Lighting." The secretary of the branch is Miss R. F. Kennedy, 251, Sauchiehall Street, Glasgow. The Association has arranged a lecture on electricity for the nurses at the Westminster Infants' Hospital during this month, which will be given by Miss E. E. Wilson, the chair being taken by Mrs. Leslie Gamage, deputy chairman and hon. secretary of the Hospital Appeal Fund. Members of the Association were to visit on December 8th a special display of "Sun Ray" radiators at 50, Oxford Street, London, when a short talk on "The Sun Ray Radiator and Sun Ray Applications" was to be given by Mr. A. F. Berry.

Finsbury Technical College.—In the course of the Streatfield Memorial Lecture, which was given at Finsbury Technical College on December 3rd by Mr. F. H. Carr, director of British Drug Houses, Ltd., under the chairmanship of Sir William J. Pope, the lecturer said that the college could no longer be continued, and in a few months it would close, in spite of the great purpose it had served. This would produce in many a feeling of deep disappointment, though they would remember that warm thanks were due to the City and Guilds of London Institute for its great work there for over 40 years. When the laboratories and buildings of the college were vacated it was not impossible that the City and Guilds would assign them for the development of a college of chemical engineering. There was need for chemical engineering training on an adequate scale, and he believed that the council of the Institute would give favourable consideration to any scheme which offered reasonable prospects of success. He would look to the council named to appoint a delegacy consisting of representatives of the Institute, the Association of British Chemical Manufacturers, the Institution of Chemical Engineers, and others who might help in the realisation of that great purpose. With buildings and equipment privided, £10,000 per annum, *plus* fees from students, would probably maintain a College of Chemical Engineering.—*The Times.*

B.E.S.A. Publications.—The British Engineering Standards Association has just published the following new and revised specifications:—No. 42, 1925, Reciprocating Steam Engines for Electrical Purposes; No. 120, 1925, Gas Engines for Electrical Purposes; No. 211, 1925, Heavy-Oil Engines for Electrical Purposes, Diesel Type, Air-Injection; No. 212, 1925, Heavy-Oil Engines for Electrical Purposes, Surface-Ignition Type; and No. 213, 1925, Heavy-Oil Engines for Electrical Purposes, Airless-Injection, Cold Starting Type. The specification for reciprocating steam engines is a new edition of the original specification No. 42 issued in 1909. All the clauses have been modified and brought up to date and a number of additions have been made. The rating of the steam engine is specified as the load in b.h.p. assigned to it by the maker to satisfy the requirements of the purchaser and to comply with the specification: a margin of capacity of 25 per cent. above the rated output is called for. The cyclic irregularity has been defined and limits given, and the question of flywheel effect is dealt with. Steam and exhaust pressures, standard speeds, speed adjustments for paralleling and governing, and the equipment which is to form part of the standard engine are also given, together with appendices setting forth the particulars which should be supplied to the engine-maker and the particulars to be supplied by him.

The four specifications for gas engines and heavy-oil engines were prepared concurrently, and the aim has been to secure consistency and uniformity regarding the salient features as far as practicable. The rating in each case is defined as the load in b.h.p. which the engine can carry continuously for a period of 12 hours at its rated speed when working under the stated conditions of pressure and temperature, and in the case of gas engines, with gas of the given calorific value. The engine must be capable of developing for one hour, 10 per cent. above this rating. Clauses are also included regarding the selection of the size of engine required to suit the capacity of a specified generator; the cyclic irregularity and the question of flywheel; the permissible variation in speed for paralleling and governing; the allowance to be made when an engine is working under non-standard atmospheric conditions; gas or fuel consumption; and tests and standard equipment.

The Association has also issued two publications, one giving standard dimensions for dynamos, distributor mountings, starting motors, and dynamotors for automobiles (No. 5,031-5034, 1925), and the other containing similar dimensions for small couplings for internal-combustion engines (No. 5,035, 1925). The first includes four specifications for the over-all and other important measurements, which are useful to the designer when arranging the placing of the various accessories in the chassis. When universally adopted it will be possible to replace or interchange the various makes of these fittings without costly alterations. The second publication, or fifth specification, is also dimensional, and gives all that is necessary for interchangeability. The dimensions in each are given both in inches and millimetres. The new standards contained are based upon the provisional standards Nos. 15, 16, 17, 18, and 19 of the Society of Motor Manufacturers and Traders, Ltd., published in the Data Sheets of the Institution of Automobile Engineers. They were submitted to the B.E.S.A. for consideration and approval, and have now been issued as British standards.

Copies of these publications may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

STANDARDISATION RULES FOR ELECTRICAL MACHINERY.—The revision of B.E.S.A. Publication No. 72-1,917, Standardisation Rules for Electrical Machinery, is now nearing completion. Early in the deliberations of the committee which has undertaken the revision it was decided to divide this publication into eight different parts, each part to be issued as a separate specification. Two parts have already been issued, namely, No. 168, "Electrical Performance of Industrial Electric Motors and Generators with Class A Insulation," published in February, 1923, and No. 173, "Electrical Performance of Traction Motors (Direct-current Series Wound)," published in December, 1923. The B.E.S.A. now announces the publication of three further parts, as follows:—

B.S.S. No. 169, "Electrical Performance of Large Electric Generators and Motors (Load with Overload Rating)."
B.S.S. No. 225, "Electrical Performance of Alternators of the Steam Turbine-driven Type."
B.S.S. No. 226, "Electrical Performance of Large Electric Generators and Motors (Continuous Maximum Rating)."

The temperature rises included in these three specifications were agreed at the meeting of the International Elctrotechnical Commission, held at The Hague last April. It is hoped to complete the three remaining parts of the revised publication, *i.e.*, Transformers, Rotary Converters, and Fractional Horse-power motors, early in the New Year.

Institution Notes.

Institution of Electrical Engineers.—WESTERN CENTRE.—A lecture, illustrated with lantern slides, on "Switchgear Developments During the Last 20 Years," by Mr. J. H. Thomas, M.I.E.E., Cardiff, of the technical staff of the General Electric Co., Ltd., attracted a large attendance at the South Wales Institute of Engineers, Cardiff, on November 30th. The meeting was presided over by Mr. J. W. Burr, borough electrical engineer, Swansea, and a discussion followed. The lecturer declared that this country was far ahead of the Continent and the United States with regard to switchgear for industrial and colliery work. It was in this direction that the most radical changes had taken place in modern times. Development had been so rapid with regard to high-pressure work that the standardisation of a great many important classes of gear had been impossible, and any attempt at standardisation would have retarded progress. Regulations had been drawn up, but without a recognised testing authority they led to misinterpretations and sometimes mis-statements. Valuable work, however, had been done by Sheffield University in testing colliery switchgear designed to be explosion-proof, and also by the British Engineering Standards Association, but certain gear which had been standardised was almost obsolete. Rules and regulations, which were sometimes unnecessarily severe, increased the cost of overhead lines and switchgear. In industrial and colliery work, particularly on the surface, a good deal of expensive oil-break gear was installed which was not really necessary.

SCOTTISH CENTRE DINNER.—A representative company of 300 attended the annual dinner of the Scottish Centre of the Institution in Glasgow on December 2nd, at which Prof. Magnus MacLean, D.Sc., LL.D., presided. Lord Blythswood toasted "The Institution of Electrical Engineers." Mr. R. A. Chattock, in reply, said Glasgow had to be congratulated on being one of the first cities to establish an Electricity Service Bureau, an organisation for educating the public to use electricity properly. The Institution, he said, was now adapting itself to the needs of its 12,000 members, and he thought it was unfortunate that a proposal had been made to establish an institution independent of the Institution of Electrical Engineers for radio engineers. He felt it was quite unnecessary, and it was bad policy to divide the interests of the profession in that way, which must lead to overlapping and ultimate chaos. It was quite possible, of course, that wireless might be developed to a greater extent than it was at present, and might supplant their own distribution methods, and they must keep an eye on it and watch developments to see if it could be fitted into their new

business. The establishment of another institution in connection with fuel economy had also been mooted. A more unnecessary suggestion he had never heard made. Here, also, they were vitally interested, and would be glad to discuss the question and explore it jointly with mechanical engineers.

Institution of Lighting Engineers.—LEEDS CONFERENCE EXPENSES.—At Leeds City Council, on December 2nd, Sir Charles Wilson, chairman of the Finance Committee, protested vigorously against the expenditure of £327 in entertaining delegates at the annual conference of the Institution at Leeds, in September. He moved that expenses in connection with conferences of organisations concerning public administration be not incurred without first obtaining the sanction of the Finance Committee. The resolution was seconded by Councillor Stanley Horrell, and Alderman G. Ratcliffe, chairman of the Leeds Gas Committee, vigorously opposed the proposition. He contended that the Street Lighting Sub-Committee had full authority by resolution for the expenditure incurred, and said the hospitality at Leeds was parsimonious in comparison with that at Glasgow the previous year. After further discussion the resolution was withdrawn, on the understanding that in future entertainment estimates should be presented to the City Council beforehand.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The Edinburgh Tramways Committee has decided to recommend that the salary of Mr. F. A. FITZPAYNE, deputy tramway manager, be increased next May to £850 per annum and to £900 in the year following.

The Hornsey Council Electricity Committee recommends paying the borough electrical engineer the sum of five hundred guineas for the extra duties undertaken by him in connection with the extension of the plant, and a sum not exceeding £500 to those members of his staff, in such proportions as may be determined, who have also carried out extra work involved by the extension scheme.

The Bristol Corporation Salaries Committee recommends increasing the salary of Mr. PROSSER, the sales manager of the electricity department, from £600 to £700 per annum.

With reference to the shooting of Mr. LEONARD JOHNSON, Corporation traffic manager of Birmingham, by John Henry Cuttler, a chief inspector of the tramways, the latter was on Saturday last charged at the Birmingham Assizes with attempted murder. Evidence was given for the defence to show that the revolver was not intentionally discharged and the jury returned a verdict of not guilty either of intent to murder or to cause bodily harm.

Mr. O. G. LEE, of the Liverpool Post Office service, has been appointed telephone district manager at Southampton and has started his duties there. He entered the service in the days of the National Telephone Co., and rose to the position of telephone contracts manager in Liverpool.

The Doncaster Electricity Committee recommends Mr. E. Ross, of Tynemouth, for appointment as sales engineer in the Corporation Electricity Department, at a commencing salary of £300 per annum, rising to £350, by annual increments of £25.

Mr. H. C. HEAD-JENNER has resigned his position as director of the Sheffield relay station of the British Broadcasting Company, and is succeeded by Major T. H. HOWARD. Mr. Head-Jenner is about to commence business in Sheffield as a wireless expert.

Mr. R. C. HALL has resigned the position of municipal electrical engineer at Riversdale, South Africa. His address is Oakleigh, College Road, Rondebosch, Cape Province.

Mr. J. W. WILKINSON, A.M.I.E.E., M.A.Min.E.E., has been appointed sales and export manager to Electrical Utilities, Ltd.

Obituary.—MR. W. H. BAUGHAN.—The death occurred on November 23rd of Mr. W. H. Baughan, one of the pioneers of the British electrical industry. He commenced business at Charibury (Oxon) in 1876, making electric bells, telephones, indicators, lightning conductors, &c. His products were sold in large quantities to the leading London and provincial houses and a sound export trade was done. All the components had to be made in Mr. Baughan's own factory and the coil winding was done by hand. Later, Continental competition was felt and the business developed on contracting lines with an independent connection. Mr. Baughan retired in 1905 in favour of his son, Mr. A. H. V. Baughan, M.I.E.E., and the latter subsequently turned the business into a limited company, retiring in 1918.

MR. H. GRIFFITHS.—Mr. Harry Griffiths, A.M.I.E.E., district engineer at Newcastle-on-Tyne to the Metropolitan-Vickers Electrical Co., Ltd., was the victim of a fatal accident on December 4th, when a transformer which was being installed at the premises of the Co-operative Wholesale Society, Blandford Street, fell upon him. Previous to joining the Metropolitan-Vickers Co., Mr. Griffiths was chief electrical engineer to the Caledon Shipbuilding Co., Dundee, for several years.

MR. H. W. MORLEY.—We regret to learn that Mr. H. W. Morley, for many years managing director of Messrs. Cole, Marchent & Morley, Ltd., of Bradford, passed away last month at Northampton at the age of 59 years. Previous to his connection with the above company Mr. Morley had held appointments with Messrs. Hick, Hargreaves & Co., of Bolton, and with Mr. Wilson Hartnell at Leeds.

MR. C. GEEN.—The death occurred at Newton Abbot, on November 28th, at the age of 85 years, of Mr. Charles Geen, who had for over 26 years been managing director of the Lynton and Lynmouth Electricity Co. Mr. Geen initiated the supply of electricity for Lynton and Lynmouth, and the business was later made over to the present company.

MR. E. WILKINS.—The death occurred, on November 25th, of Mr. Edmund Wilkins, of Bilston, who had for upwards of 25 years been engaged at the Mount Pleasant depôt of the Midland Electric Corporation for Power Distribution, Ltd. He was 68 years of age.

New Companies Registered.

Sydney Hellyar, Ltd. (210,101).—Private company. Registered December 3rd. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineering contractors, general, mechanical, constructional, marine and civil engineers, manufacturers, importers and exporters of and dealers in electrical, magnetic or galvanic and motor engines, &c., to adopt an agreement with S. Hellyar and J. L. Shearme. The first directors are:—H. S. Marquand, Northwood, Woodcote Road, Leigh-on-Sea, electrical contractor (permanent chairman and governing director); J. L. Shearme, 29, Merton Avenue, Chiswick, W.4, electrical contractor. Qualification, 10 ordinary shares. Secretary: H. S. Marquand. Registered office: 4, South Place, E.C.2.

B.S.A. Radio, Ltd. (210,069).—Registered as a private company on December 2nd with a nominal capital of £2,000 in £1 shares. Objects: To carry on the business of manufacturers and factors of and dealers in all kinds of apparatus, articles and accessories used in connection with electrical and other transmission and reception of words, sounds, symbols, drawings, photographs and pictures, whether with or without conductors, and any other use for which wireless electricity may be applied or adapted, electrical engineers, &c. The subscribers (each with one share) are:—J. H. Rice, 81, Oxford Road, Moseley, Birmingham; and G. J. Withington, The Gables, Francis Road, Stechford, Birmingham, accountant. The first directors are Sir Hallewell Rogers, Percy Martin, and Willoughby L. B. Baylay. No qualification required. Remuneration, £50 each per annum (chairman, £250). Solicitors: Pinsent & Co., 6, Bennetts Hill, Birmingham.

H. and S. W. Thomas Co., Ltd. (210,074).—Private company. Registered December 2nd. Capital, £2,000 in £1 shares. Objects: To acquire the business of electric lighting now carried on by "H. Thomas and S. W. Thomas" at Saundersfoot, Pembrokeshire. The first directors are:—H. Thomas, 1, Bellevue, Tenby; S. W. Thomas, Delphi, South Parade, Tenby. Qualification, 100 shares. Secretary and solicitor: F. E. L. M. Thomas, Tenby House, Tenby. Registered office: 1, Bellevue, Tenby, Pembrokeshire.

Electro Acoustics, Ltd. (210,052).—Private company. Registered December 2nd. Capital, £250 in £1 shares. Objects: To carry on the business of electricians, electrical engineers and contractors, mechanical engineers, machinists, metal workers, tool makers, wood workers, suppliers of electricity for purposes of light, heat, motive power, telegraphy, telephony or otherwise, manufacturers of and dealers in amplifiers, condensers, detectors, magnetos, &c. The first directors are:—E. J. E. Bean, The Spinney, Pollards Hill North, Norbury, S.W.16; F. H. Burgess, 69, Braxted Park, Streatham Common, S.W.16; C. W. Nadal, 60, Meath Road, Ilford, Essex. Secretary: C. W. Nadal. Solicitors: Headley, Dalzell and Dickinson, 8, Stone Buildings, Lincoln's Inn, W.C.2. Registered office: 175a, Peckham Park Road, S.E.15.

Haydey, Ltd. (210,077).—Private company. Registered December 2nd. Capital, £500 in £1 shares (425 "A" and 75 "B"). Objects: To acquire the business of a manufacturer of wireless sets and accessories carried on by Maude A. Adey at 5, Great Peter Street, Westminster. The subscribers (each with one share) are:—J. G. Hay, 20, North Audley Street, W.1, retired officer; H. W. Adey, 10, Lamballe Road, Hampstead, electrical engineer. Lt.-Col. J. G. Hay is sole director, and may retain office for life. Solicitors: Williams and Poole, 166, Fulham Road, S.W.3. Registered office: 5, Great Peter Street, S.W.1.

The Gretna and District Electricity Supply Co., Ltd. (13,897).—Registered in Edinburgh as a public company on November 30th, with a nominal capital of £15,000 in £1 shares. The objects are to take over part of the business of electricity supply carried on by H.M. Factory, Gretna, in the Counties of Dumfries and Cumberland. The first directors are:—P. M. Carlyle, The Gables, Gretna, medical practitioner; J. S. Wise, 86, The Rand, Eastriggs, Dumfries, electrical engineer; T. C. Tatnall, 101, Annan Road, Gretna, merchant; J. W. Matthew, The Crescent, Eastriggs, Dumfries, mechanical engineer; J. S. Moir, Gordon House, Gretna, Dumfries, surveyor; J. Elliot Millar, 3, The Ridge, Eastriggs, Dumfries, retired; G. Ritchie, Central Avenue, Gretna, stationer. Minimum cash subscription, £4,000. Qualification, 200 shares. Secretary: J. Hutcheon. Registered office: 58, Annan Road, Gretna.

Ashley Wireless Telephone Co. (1925), Ltd. (210,014).—Private company. Registered November 30th. Capital, £2,500 in £1 shares. Objects: To carry on the business of wireless telephone and telegraph engineers, manufacturers of wireless apparatus, &c. The subscribers (each with one share) are:—H. Dewhurst, 40, Tynwald Hill, Stoneycroft, Liverpool, electrical engineer; W. A. Brooke, 45, Pilkington Road, Southport, radio engineer. The first directors are to be appointed by the subscribers. Qualification, £50. Secretary: J. V. Underwood. Solicitor: T. G. Henry, 11, Lord Street, Liverpool. Registered office: 24, North John Street, Liverpool.

Pyramid Products, Ltd. (210,042).—Private company. Registered December 1st. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless electrical engineer carried on by Francis Addie at 4, Cornbrook Place, Stretford, Lancs. The first directors are:—F. Addie, 90, Derby Street, Moss Side, Manchester, electrical engineer; J. H. Burrows, The Bungalow, Witham Road, Woodhall Spa, Lincs., engineer (life directors). Qualification, 1 share. Secretary: F. Addie. Registered office: 4, Cornbrook Place, Chester Road, Manchester.

Selfix Electric Co., Ltd. (210,024).—Private company. Registered November 30th. Capital, £1,000 in £1 shares. Objects: To acquire the business belonging to R. E. Robson and W. F. T. Pinkney, initiated by them in connection with the electrical illumination, lighting, power, equipment, heating and other electrical agencies, and to carry on the business of electricians, electrical and mechanical engineers, &c. The directors are:—R. E. Robson, "Greenside," Linden Avenue, Gosforth; W. F. T. Pinkney, 3, Douglas Avenue, Gosforth; H. S. Bird, 58, Grey Street, Newcastle-on-Tyne. The said R. E. Robson shall be permanent so long as he holds 25 ordinary shares. Qualification of directors, 25 ordinary shares. Secretary: N. B. Ridley. Solicitors: W. C. Soden-Bird, 58, Grey Street, Newcastle-on-Tyne. Registered office: 32, Grainger Street West, Newcastle-on-Tyne.

Official Returns of Electrical Companies.

Belling & Lee, Ltd.—Particulars filed of £2,000 debentures authorised November 21st, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, if any, the amount of the present issue being £1,500.

Kirby (Wimbledon), Ltd. — Debenture dated November 23rd, 1925, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: C. H. Benmore, 16, Pembroke Square, W., and W. T. Greenland, 8, Dunmore Road, Wimbledon, S.W.

Oco Electrical Appliances, Ltd.—Debenture dated November 18th, 1925, to secure £750, constituting a specific charge on the company's land in London and all other freehold, leasehold and copyhold properties and a floating charge on the company's undertaking and other property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd. 15, Bishopsgate, E.C.

Greenwich Cable Works, Ltd. (formerly New Gutta Percha Co., Ltd.).—Satisfaction in full (*a*) on June 11th, 1925, of mortgage, registered charges, and collateral charge and registered charge, all dated July 10th, 1924, securing £2,000; and (*b*) on October 27th, 1925, of mortgage and four registered charges, all dated September 12th, 1921, securing £2,000. (Notices filed November 27th, 1925.)

Landis & Gyr, Ltd.—Deed of covenant dated November 11th, to secure all moneys to become payable to the mortgagees under a building agreement dated October 13th, 1925, charged on certain land in Victoria Road, Acton. Holders: Edwards Construction Co., Ltd., 17, Throgmorton Avenue, E.C.2.

Sterling Telephone & Electric Co., Ltd. (101,415).—Capital, £65,000 in 49,650 preference and 15,350 ordinary shares of £1 each. Return dated September 7th, 1925. 39,500 preference and 15,350 ordinary shares taken up. £24,500 paid. £30,350 considered as paid. Mortgages and charges, £125,000.

Calcutta Tramways Co., Ltd. (14,764). — Capital, £1,400,000 in 700,000 ordinary and 700,000 preference shares of £1 each. Return dated June 23rd (filed September 17th), 1925. 700,000 ordinary and 250,000 preference shares taken up. £764,900 paid. £185,100 considered as paid. Mortgages and charges, £350,000 4½ per cent. first debenture stock and £250,000 7 per cent. second (registered) debentures.

H. L. Wood & Son, Ltd.—Particulars filed of £2,500 debentures authorised November 17th, 1925, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,500.

Electric and General Investment Co., Ltd. (31,506).—Capital, £301,500 in 19,900 preference and 20,000 ordinary shares of £5 each and 40,000 deferred shares of 1s. each. Return dated July 24th, 1925. All shares taken up. £121,500 paid (being £5 per share on the preference, £1 on the ordinary, and 1s. on the deferred shares). Mortgages and charges, £8,547 10s.

Sheerness and District Electric Supply Co., Ltd. (65,749).—Capital, £75,000 in £1 shares. Return dated June 18th (filed September 15th), 1925. All shares taken up. £75,000 paid. Mortgages and charges, nil.

Electric Supply Corporation, Ltd. (52,036).—Capital, £350,000 in 200,000 ordinary and 150,000 preference shares of £1 each. Return dated April 9th (filed June 11th), 1925. 150,000 ordinary and 150,000 preference shares taken up. £279,000 paid on 129,000 ordinary and 150,000 preference shares. £21,000 considered as paid on 21,000 ordinary shares. Mortgages and charges, nil.

Chepstow Electric Lighting & Power Co., Ltd. (70,646).—Capital, £10,000 in £1 shares. Return dated April 29th, 1925. 5,510 shares taken up. £1,537 paid. £3,905 considered as paid. £68 in arrears. Mortgages and charges, £3,000.

Yorkshire Switchgear & Engineering Co., Ltd. (formerly the T. S. Switchgear & Construction Co., Ltd.) (93,698).—Capital, £10,000 in £1 shares. Return dated August 4th, 1925. 5,332 shares taken up. £5,332 paid. £3,000 considered as paid. Mortgages and charges, £4,914 1s. 3d.

General Electric Co., Ltd. (67,307).—Capital, £6,000,000 in £1 shares (1,800,000 "A" preference, 1,800,000 "B" preference, and 2,400,000 ordinary). Return dated July 22nd (filed September 9th), 1925. 1,800,000 "A" preference, 1,800,000 "B" preference, and 2,111,975 ordinary shares taken up. £4,680,149 paid on 1,575,540 "A" preference, 1,777,109 "B" preference, and 1,337,500 ordinary shares. £1,024,826 considered as paid on 224,460 "A" preference, 22,891 "B" preference, and 774,475 ordinary shares. Mortgages and charges, £3,387,500.

Sun Electrical Co., Ltd. (63,261).—Capital, £100,000 in 50,000 ordinary, 20,000 preference, and 30,000 preferred ordinary shares of £1 each. Return dated November 13th, 1925. 25,062 ordinary, 17,141 preference, and 21,676 preferred ordinary shares taken up. £63,279 paid. Mortgages and charges, £16,217.

Tramways Syndicate, Ltd. (58,292).—Capital, £2,500 in £1 shares. Return dated June 3rd, 1925. 1,507 shares taken up. £7 paid. £1,500 considered as paid. Mortgages and charges, nil.

Peter Curtis, Ltd. — S. W. Rowland, of 296-302, High Holborn, W.C.1, C.A., was appointed receiver and manager on November 25th, under powers contained in debenture dated February 18th, 1925.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

International Automatic Telephone Co., Ltd.

An extraordinary general meeting of this company is called for January 5th next at Winchester House, E.C., to consider a number of resolutions. Among these, resolution (1) provides that the capital of the company shall be increased by the creation of an additional 640,000 shares of £1 each to be issued as ordinary shares conferring the same rights as, and ranking *pari passu* with, the 360,000 ordinary shares of £1 each now issued; and resolution (2) provides that the contract of December 2nd, 1925, made between the company and Messrs. Theodore Gary & Co. for the cancellation of the option granted to Messrs. Gary to purchase the ordinary shares in the company at £1 10s. per share be ratified and confirmed. A separate meeting of the holders of ordinary shares will follow the special meeting. The reasons why the resolutions have become necessary are explained at length in a circular issued by the directors to the ordinary and deferred shareholders. The company was formed in 1920 with powers to invest in companies manufacturing telephone, telegraph and other electrical apparatus; to engage in the manufacture of this apparatus; and to own and operate telephone, telegraph, wireless or cable companies in any part of the world. The company acquired the control of the Automatic Telephone Mfg. Co., Ltd., and entered into an agreement with that company for the promotion of sales of Strowger automatic telephones in colonial and foreign territories, and secure for it a substantial amount of foreign business sufficient to establish mass production and a regular output over a period of years. This arrangement has been satisfactory to both companies. In view of the development of the telephone and electrical industry throughout the world and in order that the companies shall participate freely in this development, it is thought desirable to create additional capital. On the formation of the company an option was given to Messrs. Theodore Gary & Co., Kansas City, U.S.A. (who were mainly responsible for securing to the company the contracts providing for the large amount of business referred to above), so long as they continued to hold 10,000 deferred shares in the company, to purchase from the shareholders all or any of the preference shares of the company at 21s. 6d. per share plus accrued dividend, and all or any of the ordinary shares at 30s. per share. This option has now become valuable and its removal would be beneficial to the shareholders and facilitate the expansion of the company's capital on a favourable basis. As a result of negotiations Messrs. Gary & Co. have agreed to accept an option to purchase from the company if, as and when issued, 360,000 of the 640,000 new ordinary shares which it is proposed to create, at 30s. per share, and to abandon their option on the existing and issued 360,000 ordinary shares. The provisional contract will only become effective subject to the passing of the special resolutions already mentioned. Certain trade investments have already been made and other investments are in process of negotiation. It is expected that these investments will in all necessitate the issue from time to time of approximately 140,000 new ordinary shares, leaving the balance (500,000) available to be issued as occasion may arise. Under the present capitalisation the voting power of the ordinary and deferred shares is equal; it is proposed to maintain this position under the new capitalisation and the resolutions make provision for certain of the deferred shares conferring on the holders the requisite rights.

Cape Electric Tramways, Ltd.

The report for the year ended June 30th shows a profit of £85,209, and after providing for debenture interest and redemption, and adding the balance brought forward, there is £66,461 available. From this a sum of £20,000 has been placed to reserve and £2,500 has been set aside to form the nucleus of a staff benefit fund. It is proposed to pay a final dividend of 4 per cent., free of tax, making 7 per cent. for the year, and to carry forward a balance of £9,576. The number of passengers carried and the gross receipts both decreased to a small extent owing to the general depression prevailing in South Africa. It is stated that an improvement set in during the last few months of the year. The 6 per cent. first mortgage debentures have been redeemed, and arrangements have been made to extend the period of the 5 per cent. debentures, the interest being increased to 6 per cent. Neither the Cape Town nor the Port Elizabeth municipalities has given notice to exercise its rights of expropriation of the tramway system under the terms of the concessions. The meeting is to be held on December 16th.

Burmah Electric Tramways and Lighting Co., Ltd.

Mr. C. O. Webb, chairman, presided at the annual meeting on December 2nd, and in presenting the report and accounts (which were reviewed in our last issue, p. 909), stated that, although, generally, trade had been bad in Mandalay throughout the year, it was satisfactory to note that the gross receipts had increased; the items making up the working expenses showed a decrease, with the exception of maintenance and repairs to permanent way, overhead equipment and cars. It had to be remembered that the system was 20 years old, and until considerable expenditure was incurred in renewals, the cost of maintenance would remain heavy. The lighting and power business which had been built up in Mandalay promised to outstrip the tramways in gross receipts, and it was a more profitable undertaking. It was probable that within the next few years it would be necessary to expend a considerable amount in improving the distribution system and renewing the permanent way and cars, but the company had sufficient funds in hand to meet these charges. The chairman referred to the proposed change of the company's title to the "Burma Electric Supply Co., Ltd.," which, it was considered, better described the company's business. The report and accounts were adopted, and at a subsequent extraordinary general meeting the change of the company's name was approved.

Edison Swan Electric Co., Ltd.

The report for the year ended June 30th, 1925, states that the year's trading results have been satisfactory, and the accounts show that, after making provision for the redemption of debenture stock, the profit for the year amounts to £88,344, to which has to be added a balance of £17,575 brought forward, making £105,919, which the directors recommend should be applied as follows:—7½ per cent. dividend on preference shares, £7,500; 10 per cent. dividend on ordinary shares, £19,143; transfer to reserve fund, £50,000; leaving £29,276 to be carried forward. The directors recommend a special grant of £5,000 to the chairman and managing director, Mr. C. F. Spencer, in recognition of the

exceptional services rendered by him during the past three years, to which the present satisfactory position of the company is in a large measure to be attributed. A resolution to this effect will be submitted to the meeting which is to be held on December 16th.

French Companies.

The *Société pour l'Equipement Electrique des Véhicules* reports net profits of 2,705,000 fr. for 1924-25, as compared with 2,445,000 fr. in the previous year, and it is intended to increase the rate of distribution from 45 fr. per share for 1923-24 to 50 fr. for the past year.

The directors of the *Compagnie Générale d'Electricité* recommend the payment of a dividend at the rate of 70 fr. per share for 1924-25.

British Insulated & Helsby Cables, Ltd. — At an extraordinary meeting held on December 4th, under the chairmanship of Mr. J. Taylor, a resolution was approved authorising the capitalisation of a part of the company's reserves and issuing it in the form of ordinary shares to the existing shareholders in the proportion of one new share to each three held. The chairman said that shareholders who were entitled to fractions of shares would receive the benefit of this from the sale of the aggregate of such shares in the market.

Amalgamated Wireless (Australasia), Ltd.—There was a net profit of £5,036 upon the working during the year ended June 30th last, as compared with a net loss of £21,857 in the preceding year. The work in connection with two duplex "beam" stations for direct service with Great Britain and Canada is progressing, and it is hoped to have them completed early next year. The broadcasting business was satisfactory, as was the marine section, apart from the effects of the shipping dispute.

American Loan for the A.E.G.—The *Financial News* states that negotiations are proceeding in New York between representatives of the Allgemeine Elektricitäts Gesellschaft and the National City Bank for the issue of a second series of convertible bonds. It is believed that this series will be issued on a 6½ per cent. basis.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Coventry Chain Co., Ltd.—90,000 ordinary shares of £1 each, fully paid, Nos. 310,001 to 400,000; 100,000 new ordinary shares of £1 each, fully paid, Nos. 400,001 to 500,000.

International Telephone and Telegraph Corporation.—$2,146,200 capital stock in shares of $100 each.

Kaministiquia Power Co., Ltd. (Incorporated October 1st, 1925).—£200,000 5½ per cent. first mortgage sinking fund, registered debenture stock of Series A.

Bullers, Ltd.—The report for the year ended July 31st last shows a profit of £21,984 (an increase of £3,060), and the addition of the sum brought forward makes available £26,253. After meeting the preference dividend and transferring £5,291 to the debenture sinking fund, it is proposed to pay a final dividend of 2½ per cent. on the ordinary shares (making 5 per cent., free of tax) and to carry forward £5,665.

Manaos Tramways and Lighting Co., Ltd.—The receipts for the year ended April 30th last showed a further increase, and after meeting expenses there was a net operating revenue of £7,956 (the milreis being valued at 6d.). After adding interest, &c., and deducting debenture interest and London expenses, there remains a balance of £5,686, which has been transferred to the renewals reserve.

Marconi's Wireless Telegraph Co., Ltd.—In accordance with the provisions of the trust deed, between the company and the Law Debenture Corporation, Limited, dated November 17th, 1922, for securing the 6½ per cent. convertible 10-year first debenture stock, the company has this year applied the sum of £75,000 in purchases in the market of debenture stock.

Foundation Co., Ltd.—Out of a profit of £14,165 for the year ended June 30th last, plus £4,603 brought forward, a dividend at the rate of 8 per cent. is being paid on the cumulative participating preference shares, and £11,679 is being carried forward.

Major & Co., Ltd.—Out of a profit of £23,960 (including £9,650 brought forward) the directors are paying the dividends on the 6 per cent. and 8½ per cent. preference shares and carrying forward £12,459. They regret their inability to recommend dividends on the preferred ordinary and ordinary shares.

Petters, Ltd.—The company's funding scheme has been approved by the High Court, and the certificates are being prepared.

An interim dividend has been declared on the 7½ per cent. cumulative preference shares.

Reduction of Capital.—*Mann, Egerton & Co., Ltd., and reduced.*—A petition has been presented to the High Court for the confirmation of the reduction of the capital of the company from £400,000 to £370,925, and will be heard in London on December 15th.

Anglo-Argentine Tramways Co., Ltd.—The following dividends are announced :—2s. 9d. per share on the 5½ per cent. cumulative preference shares; and 3s. per share on the 6 per cent. cumulative second preference shares.

Ruston & Hornsby, Ltd.—It is reported that the directors have decided to postpone the payment of the interim dividends on the 5 and 6 per cent. preference shares.

New Issue.—*Newcastle-upon-Tyne Electric Supply Co., Ltd.*—The recent issue of ordinary shares was over-subscribed.

Castner-Kellner Alkali Co., Ltd.—The company has declared a dividend of 14 per cent. (making 22 per cent. for the year, as in 1923-24); £70,636 has been placed to reserve, and £28,008 carried forward.

S. Smith & Sons (Motor Accessories), Ltd. — The net profit for the past year amounted to £55,652, and to this was added £23,494 brought forward, making £79,146. In view of the present financial position of the company, the whole of this has been put to reserve.

Great Northern Telegraph Co., Ltd.—An interim dividend of 5 per cent., less tax, has been declared.

Stocks and Shares.

MONDAY EVENING.

FIVE per cent., to which the Bank Rate was raised last Thursday, is deemed to be a fair working minimum, and one which seldom imposes any serious check upon Stock Exchange business at a time when the public are ready to buy and sell securities. That there would have to be a rise before Christmas, common consent had agreed, and, this being the case, a putting an end to suspense was rather welcomed than otherwise. Stock Exchange prices are no worse, and the rubber boom paid no attention to the hint that money would be more expensive at next week's settlement.

International Automatic Telephones jumped another 6s., to 42s., before the reason for the recent advance became revealed in the issue of a circular to the shareholders. We had pointed out that an American firm, Theodore Gary & Co., had an option over the ordinary shares at 30s., at which price the firm could have called them from the present proprietors. This it was which made the rise to £2 so mysterious. The company announces that the option will be cancelled by Gary & Co. in exchange for another option, also at 30s., that will give the firm the call of 360,000 new shares, at 30s., out of 640,000 shares which it is proposed to create. Meetings are to be held early in January to consider and to pass the resolutions necessary to give effect to the increase now proposed in the capital, and to modify the existing contract with Gary & Co. Upon the announcement of these particulars, the price reacted to 39s. 3d. per share.

Automatic Telephones are 9d. higher at 52s. 9d., and these are the only changes which have occurred in the telephone group.

Johnson & Phillips at 54s. 6d. are quoted ex the right to apply for the new shares at 40s. Holders of five old shares can take up one new share at £2, and the last day for sending in acceptances is Thursday in this week, December 10th. Those who have the right to do so should make a point of seeing that they secure the bonus thus offered them : too many people are apt to toss away any papers which ask for the remittance of money. The rights can be sold at about 13s. if allottees do not wish to take up their proportion of new capital.

Lancashire Electric new ordinary, issued at 22s. 6d., and the new preference, which came out at 23s. 6d., are an active and a good market on the basis of 2s. 1½d. premium. Yorkshire Electric new are being negotiated on the basis of 29s. 6d. Newcastle new ordinary, with 5s. paid, attract a good deal of business on the basis of 1s. 7½d. premium. Several other new issues are in the air, as being likely to appear between now and the fast-approaching end of the year. Clyde Valleys have risen a florin to 29s. 6d.

Chelsea Electrics put on 2s. 6d. to 2½, a compliment to the appointment of Mr. P. D. Tuckett to the company's board. City Lights are the main feature of strength in this market, the price being 5s. up at 52s. Several vague reports purport to provide the explanation for this big rise. Possibly a humdrum reason may be found in the wide difference which had been existing between the price of City shares and that of County ordinary. The latter maintain their strength at 58s. 3d.

Edison Swans are rather better at 8s. 9d., the report showing a satisfactory increase of £13,400 to £88,300, in the net profits for the year that ended on June 30th last. While the dividend remains at 10 per cent., the appropriations to carry forward, &c., are increased. Metropolitan-Vickers gained a few pence to 27s. 6d., on the excellent contracts which the company is acquiring. A fall of 1/16th lowered Siemens to 33s. 9d. People have been selling these in order to put the money into rubber shares. Brush shares are better at 26s. 3d.; English Electrics drooped to 19s. 9d. Iron and steel shares are dull, falls of small amount being frequent throughout the list. This served to bring about a sympathetic decline, to 2 9/16, in Babcock and Wilcox.

Cable securities are unusually quiet. Western Telegraphs recovered the 5s. dividend deducted last week from the price. Anglo-American deferred is once more ¼ higher. Indo-Europeans have been marked down as low as 43¼, although the nominal quotation is left unchanged at 45¼. Marconis have failed to recover, and Canadians fluctuate narrowly around 5s. 3d. Burndept Wireless have been dull upon the coming to market of a fair line of the preferred shares.

The Home Railway list is uninteresting. Districts strengthened to 47¼ Underground £10 paid shares are lower at 2¼. The public attention paid to Home Railway stocks is lukewarm. The rubber market's attractions are blamed for this, as they are for many other falls in these days. The boom in rubber shares attained, to-day, Monday, an intensity of fury which constituted a record, up to the present, for this particular market.

Share List of Electrical Companies.

	Nom	Dividend. 1925.	1924.	Price Dec. 7, 1925.	Rise or fall.	Yield p.c
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£ 1	18	14	59/9	—	4 14 1
Brompton Ordinary	1	10	10	1½	—	*6 8 1
Charing Cross Ordinary	1	14½	15	2⅞	—	6 3 1
do. do. 4½ Pref.	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2⅞	+½	5 13 0
City of London	1	15	15	52/-	+½	5 15 5
do. do. 6% Pref.	1	6	6	28/-	—	5 4 4
Clyde Valley	1	8	8	29/6	+2/-	5 8 6
County of London	1	15	15	58/3	—	5 3 0
do. do. 4% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	24/-	+6d.	5 16 8
do. 7% Pref.	1	6	7	21/6	—	6 10 8
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13	—	5 15 5
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5⅞	—	5 6 8
Metropolitan	1	10	11	36/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/6	+6d.	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15½	+½	5 14 8
South London	1	15	15	2⅞	—	5 17 1
South Metropolitan Pref.	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	45/-	—	6 13 4
Whitehall Elec. Invest. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	31/-	+1/-	5 3 3
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	67	—	5 19 5
Metropolitan	,,	4	5	70	—	7 2 10
do. District	,,	3½	3½	47½	+½	7 7 4
Underground Electric Ordinary	10	Nil	Nil	2¼	−⅛	Nil
do. do. "A"	1/-	Nil	Nil	7/-	−6d.	Nil
do. do. Income	Bonds	6	6	98	—	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24⅞	+½	6 0 8
Automatic Telephone	1	3	6	52/9	+9d.	2 5 5
Chili Telephone	5	6	5	6⅞	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	10	18	−¼	*5 9 7
Eastern Tel. Ord.	Stock	10	10	177½	—	*5 12 8
Globe Tel. and T. Ord.	10	10	10	18¾ xd	+½	*5 9 7
do. do. Pref.	10	6	6	11 xd	+½	5 8 4
Great Northern Tel.	10	22	22	34½	—	6 8 6
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi	1	10	10	1¼	—	9 17 10
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	42/6	—	*5 12 11
United R. Plate Tel.	5	8	8	7½	—	5 6 8
Western Telegraph	10	10	10	17⅞ xd	+½	*5 13 6
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8½	−⅛	7 17 2
do. do. 2nd Pref.	5	6	6	8⅛	—	8 14 6
do. do. 5% Deb.	Stock	5	5	74½	—	6 14 3
British Electric Traction Ord.	,,	6	6	120 xd	—	5 0 0
do. do. 6% Pref.	,,	6	6	105 xd	+½	5 14 3
Brazil Traction	100	4	4	78	—	5 2 7
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	9/6	9/6	97½	—	*4 17 11
do. do. Deferred	,,	129/6	129/6	115½	—	*5 12 7
do. do. Deb.	,,	4½	4½	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	—	7 17 6
Mexican Light Common	100	Nil	Nil	31½	—	Nil
do. Pref.	100	Nil	Nil	61½	—	Nil
do. 1st Bonds	—	5	6	72	—	6 18 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	51/3	−9d.	*4 13 4
British Aluminium Ord.	1	5	10	38	—	5 5 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3½	—	4 2 9
Brush Ord.	1	10	10	26/3	+9d.	7 12 4
Callenders	1	15	15	3½	—	4 10 7
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	13/9	—	... ...
Edison-Swan	4/-	10	10	8/9	+6d.	4 11 6
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	1	10	10	33/9	—	6 6 0
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	19/9	−6d.	5 1 3
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6¾	6¾	24/- xd	+2d.	5 8 4
do. Ord.	1	6	7½	28/6	—	5 5 3
Henley	1	15	16	3½	—	4 11 6
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1¼ xd	—	*4 9 0
Johnson & Phillips	1	10	10	54/6 xr	—	3 13 7
Met-Vickers, Ord.	1	8	8	27/6	+6d.	5 16 8
do. Pref.	2	8	8	32	—	6 14 9
Siemens Ord.	1	—	7½	33/9	−1½	4 9 0
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c		Price December 8th.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	5½d.	
a Ammoniac, Sal	per ton	£60	
a Ammonia, Muriate (large crystal)	,,	£52	
a Bisulphide of Carbon	,,		
a Borax	,,	£25	
a Copper Sulphate	,,	£26 10s.	
a Potash, Chlorate	per lb.	4d. to 4½d.	
a ,, Perchlorate	,,	5½d.	
a Shellac	per cwt.	£15 15s.	
a Sulphur, Commercial	,,	£8 10s	
a ,, Roll	,,	£8 10s	
a Soda, Chlorate	per lb.	3½d. to 3¾d.	
a ,, Crystals	per ton	£5 to £5 5s	
a Sodium Bichromate, casks	per lb.	4d	
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	
b ,, Wire	per lb.	1/9 to 2/6*	
b ,, Sheet	,,	1/8 to 2/	
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£356	£3 inc.
Grade II	,, ,,	£182	£1 inc.
Grade III	,, ,,	£100	...
c Brass (rolled metal 2" to 12" basis)	per lb.	9½d.	½d. dec.
c ,, Tubes (solid drawn)	,,	1/- to 1/0½	...
c ,, Wire, basis	,,	10½d.	½d. dec.
c Copper Tubes (solid drawn)	,,	1/1	½d. dec.
c ,, Bars (best selected)	per ton	£92	...
c ,, Sheet	,,	£92	...
c ,, Rod	,,	£92	...
d ,, (Electrolytic) Bars	,,	£86 5s.	£3 dec.
d ,, Sheets	,,	£148 10s.	...
d ,, Wire Rods	,,	£76 5s.	£1 dec.
d ,, H.C. Wire	per lb.	9⅛d.	½d. dec.
f Ebonite Rod	,,	2/3 to 2/4	...
f Sheet	,,	2/3 to 2/6	...
g German Silver Wire	,,	2/8	...
h Gutta-percha, fine	,,	5/9	...
h India-rubber, Para fine	,,	4/6	6d. inc.
f Iron Pig (Cleveland Warrants)	per ton	nom.	...
f ,, Wire, galv. No. 8, P.O. qual	,,	£12	...
g Lead, English Pig	,,	£36	25/- dec.
g Mercury	per box	£15	5/- to 7/6 inc.
e Mica (in original cases) small	per lb.	3d. to 3/-	...
e ,, ,, medium	,,	4/- to 8/-	...
e ,, ,, large	,,	10/- to 30/- & up	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/8	...
p ,, ,, rolled strip & sheet	,,	1/9½	...
p ,, ,, wire	,,	1 8½	½d. dec.
c Platinum	per oz	£3-	...
d Silicium Bronze Wire	per lb	1/0½	...
r Steel Magnet, in bars	,,	7½d	...
n Tin, Block (English)	per ton	£238 to £267	£3 10/- to £4 inc.
n ,, Wire, Nos. 1 to 16	per lb.	4/5	2d. inc.

*For 1 cwt. lots. Special quotations against definite specifications

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co. Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Exhibition of the Physical Society of London and the Optical Society.—This exhibition, which is to be held on January 5th, 6th and 7th, 1926, at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London, will be open in the afternoon (from 3 to 6 p.m.), and in the evening (from 7 to 10 p.m.).

Mr. J. E. Barnard, F.R.S., will give a lecture on "The Search for Ultra-Microscopic Organisms," at 8 p.m. on January 5th; Professor A. F. C. Pollard, A.R.C.S., A.M.I.E.E., will give a lecture on "The Mechanical Design of Instruments" at 8 p.m. on January 6th; and Major W. S. Tucker, D.Sc., will give a lecture on "Electrical Listening" at 8 p.m. on January 7th. These lectures will be illustrated by lantern slides and experiments. Some 70 firms will exhibit scientific apparatus, and in addition there will be a group of non-commercial exhibits by Fellows of the Societies and others, including demonstrations of famous historical experiments in physics, recent physical research, and effective lecture experiments.

It has been decided to open the exhibition to the general public on the third day, January 7th. On January 5th and 6th tickets of admission will be required.

We understand that invitations relating to January 5th and 6th have been given to the Institution of Electrical Engineers, the Institution of Mechanical Engineers, the Chemical Society, the Radio Society of Great Britain, the Röntgen Society, the Faraday Society, and other scientific bodies. Members of such Societies should apply for tickets to the Secretary of the Society to which they belong. Others interested should apply directly to Professor A. O. Rankine, Imperial College of Science and Technology, South Kensington, London, S.W.7.

The Work of the Electricity Commissioners.

The Fifth Annual Report.*

(*Continued from page* 915).

Re-organisation of Electricity Supply.

At the end of the period covered by the report, schemes for the improvement of the organisation for the supply of electricity in six electricity districts had come into force. Four of these schemes came into operation during the previous year, the two additional schemes being in respect of the East Midlands Electricity District and the Edinburgh and Lothians Electricity District.

A noteworthy feature of the past year was the conclusion of the proceedings before the Commissioners in connection with the re-organisation of supply in the London and Home Counties electricity district, which had occupied their attention throughout a period of four years.

Since the coming into force of the North Wales and South Cheshire Electricity District Order, the North Wales Power Company has pressed forward actively with the establishment of the transmission scheme, and the marked progress already made has not only resulted in the supersession of local generation at a number of centres owing to the availability of bulk supplies, but has also stimulated a number of applications for Special Orders for distribution powers in new areas capable of being developed by means of supplies from the transmission system.

On July 8th, 1924, the Commissioners made an Order constituting the Edinburgh and Lothians Electricity District and on December 16th, 1924, the Order came into operation. A map is given showing the approximate boundary of the district as finally determined, and the engineering features of the district. The generating stations in existence or sanctioned at March 31st, 1925, have a capacity of 52,785 kW, of which Portobello accounts for 40,000 kW.

A new draft Order and Scheme for the London and Home Counties Electricity District was published by the Commissioners on March 31st, 1924. A local inquiry was held on May 5th, 1924, and following days, and on July 17th, 1924, the Commissioners made an Order constituting the Electricity District and establishing the Joint Electricity Authority.

The Minister of Transport caused a public inquiry to be held on March 9th, 1925, into the representations made to him during the confirmation proceedings, and confirmed the Order on May 20th, 1925, with certain amendments. The Order came into force on July 29th, 1925. A map is given showing the approximate boundary of the Electricity District finally determined and the engineering features of the district. Particulars of the generating stations of authorised undertakers in the district are set out in a table, together with figures showing the capacity in kilowatts.

The total capacity of the generating plant installed and/or sanctioned at March 31st, 1925, amounted to 1,139,232 kW, divided between local authority and company undertakers in the approximate proportions of 43 per cent. and 57 per cent. respectively.

Under the Technical Scheme scheduled to the District Order, the stations denoted by a triangle on the map may be regarded as suitable for extension so as ultimately to form principal generating stations. The remaining stations in existence at March 31st, 1925, are denoted by squares on the map, the majority being classified in two main categories in the Technical Scheme.

The main transmission and interconnecting lines in existence or sanctioned at March 31st, 1925, are denoted by full lines on the map. The Technical Scheme provides that the additional mains shown in dotted lines on the map may be regarded as required during the first stage of development for the purpose of making effective use of the generating plant in the district and of supplementing the existing interconnecting and bulk supply mains.

The West Midlands Electricity District comprises a part of the district provisionally determined by the Commissioners, in 1920, as the North West Midlands Electricity District. Events led to the subdivision of the originally contemplated district and to the renaming of a portion thereof.

An interim local inquiry was held by the Commissioners at Wolverhampton on October 21st, 1924, after which the Commissioners prepared a draft Order embodying an approved scheme for the southern area, which was renamed the West Midlands Electricity District. The scheme provided for the exclusion from the area of supply of the Shropshire, Worcestershire and Staffordshire Electric Power Company of so much of the said area as was within the district, and in consideration for such exclusion conferred upon the Power Company powers to supply electricity for all purposes in certain other portions of the area of supply under the Company's Power Acts.

The Technical Scheme provided for the utilisation of certain specified generating stations; for the early erection, in sections, of a new capital station at Ironbridge; for the subsequent erection, in sections, of a further capital station at Rugeley, and for the establishment of various transmission lines.

The Local Inquiry into the approved scheme was held in December, 1924, and the Commissioners, in April, 1925, made the Order and submitted it to the Minister of Transport for confirmation.

The West Midlands District provides the only instance, among all the districts hitherto dealt with by the Commissioners, where the full support of all the local authority and company undertakers concerned has been forthcoming both to the establishment of a Joint Electricity Authority and to the transfer of the generating stations in the District to the Joint Authority. Moreover, the District provides the first instance in which there was concurrence on the part of a power company to exclusion from a District under the machinery provided by the Act of 1922 in consideration of the granting of powers to supply for all purposes in other portions of the power company's area of supply.

At the commencement of the period covered by the Report, the draft Order and Scheme for the West Riding (Aire and Calder) Electricity District was in course of settlement by the Commissioners, and the Yorkshire Electric Power Company was taking the necessary steps to secure the assent of Parliament to the introduction of a Bill to give effect to certain heads of the settlement arrived at between the Power Company and the other principal parties in the District during the course of the local inquiry held in February, 1924. The Power Company obtained the necessary assent, and the Commissioners held a conference at the end of April with the principal parties and their Counsel.

Following the decision of a Committee of the House of Lords in July that the Power Company's Bill should not be allowed to proceed, the Commissioners reviewed the position in consultation with the principal parties, with the object of determining whether the scheme could be rendered effective without supplemental legislation.

On May 22nd, 1925, the Company notified the Commissioners that Counsel had advised that the scheme could not be carried out in the manner proposed so as to give the Company the security which would have been provided had the Bill and District Order been confirmed; and that the directors had reluctantly come to the conclusion that no useful purpose would be served by pursuing the matter further.

The Commissioners held a local inquiry at Glasgow in April, 1924, into a scheme for the West of Scotland Electricity District, but after consideration of the evidence put forward and having regard to the possible alteration in the circumstances as the outcome of the developments outlined by the Government in July, 1924, decided to defer issuing any pronouncement upon the submitted scheme.

As the outcome of the proceedings in connection with the reorganisation of supply in the North-West Midlands Electricity District, and following the decision of the Commissioners to deal separately with the southern and northern portions of the District the Commissioners issued a notice in December, 1924, provisionally determining the northern portion as a separate District under the name of the North-West Midlands Electricity District, and providing for the submission of a scheme.

The adjourned local inquiry into the draft Order and Scheme for the Mersey and West Lancashire Electricity District was not resumed, and no material progress was made with the scheme of reorganisation during the year. The Commissioners were influenced by the circumstances previously referred to and refrained from taking active steps to bring about a settlement between the parties in the District. For similar reasons, in connection with the reluctance of the Corporations of Sheffield and Rotherham to accept the establishment of a Joint Authority for the North-East Midlands Electricity District, the Commissioners decided to defer consideration of the matter pending a decision by the Government as to its policy with regard to electrical development generally.

General Observations.

In view of the investigations on the question of the further development of electricity supply in Great Britain which were in progress on behalf of the Government at the date to which the report is made, the Commissioners have felt it unnecessary to make any comments upon the general course of the proceedings before them during the past year in connection with the reorganisation of supply.

It is recorded, however, that the Commissioners have made representations to the Minister of Transport with a view to the removal by further legislation of various limitations and difficulties which have hitherto been found to preclude effective and expeditious action.

(To be continued.)

* H.M. Stationery Office; price 2s. 6d. net.

Co-operation.—In part 6 of the "Electrical Educator" (Pitman) there is a brief article by Mr. D. N. Dunlop on "Co-operation in the Electrical Industry."

A Review of the Electrical Industry.

By A. G. ELLIS.

(*Abstract of Chairman's Address*: NORTH-WESTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

(*Concluded from page* 914.)

On the Chester Corporation system there are some 15 miles of 3-phase, 6,600-volt overhead line, with 13 open-air sub-stations, stepping down to 400/230 volts and supplying 20 miles of 4-wire overhead distribution lines. The area served is about 70 square miles, and already nearly 600 consumers are connected, representing a load connection of 952 kW.

On the Mid-Cheshire system, with its centre at Northwich, there are in use or under construction 21 miles of overhead 3-phase transmission line at 33,000 volts, covering an area of 120 square miles and designed to feed three towns (Knutsford, Winsford and Middlewich) and about 25 villages within a radius of about six miles.

The village and country lines in use represent a load of about 150 kW and 100,000 kWh sold per annum, but within a few months this will increase. The charges in the country areas are the same as in Northwich and the other towns.

For distribution to the small towns and larger villages adjacent to the transmission line the pressure is stepped down from 33,000 volts to 400/230 volts, 3-phase, by outdoor transforming units of the simplest possible composition, comprising oil-immersed self-cooled transformer, horn-type air-break switches, and horn-type h.p. fuses. The smaller villages are dealt with in connection with country lines, which are supplied at 3,300 volts single-phase from outdoor sub-stations on the 33,000-volt routes.

The country lines feed villages, mansions and farms, through pole-mounted single-phase transformers at 3,300/220 volts. The cost of running these country lines for 3-phase distribution would be prohibitive; and no difficulty has been experienced in the use of single-phase motors, as they rarely are required to start under load.

Even with single-phase two-wire lines the cost of extending to small consumers some distance from the main h.p. line is too high and only the larger consumers, or small ones *en route* between large ones, can profitably be taken in. To reach outlying consumers Mr. Fennell proposes, as soon as the necessary authority can be obtained, to run an experimental single-phase, 3,300-volt single line, with earth return. This system, if authorised, will go a long way towards transmitting cheap power to small consumers over widely distributed areas.

Apart from the capital cost of the transmission line the cost of tapping it for a small amount of power is an important factor, which will have a decided influence on the transmission voltage chosen. It is not economical to build a 33,000-volt transformer for a smaller rating than about 20 kVA, single-phase, or 30 kVA 3-phase; but at 3,300 volts the limits are about 2 and 3 kVA respectively.

For these smallest economic ratings the equipment (including transformer) for tapping a 33,000-volt line need not cost more than £150 for single-phase and £200 for 3-phase, or for a 3,300-volt line £35 for single-phase and £60 for 3-phase.

The small outdoor sub-station can be mounted on a single pole for sizes up to 30 kVA, at 3,300 volts; 33,000-volt gear is naturally much heavier and requires an auxiliary pole with a wooden platform, or, alternatively, a concrete raft, with switches and fuses mounted on a pole. This equipment is neither unsafe nor unsightly: as an example of safety, I recently saw near Northwich a flock of sheep warming their noses on a 33,000-volt transformer by the wayside. As to sightliness, the populace have long been used to overhead telegraph and telephone lines, and high-pressure overhead lines are at least no more detrimental to the appearance of the country; in fact, the lines appearing on the face of Cheshire are gradually giving it the beauty of Switzerland.

(2) *Standardisation.*—The second factor in the obtaining of cheap production, on which we need to concentrate, is standardisation; and to effect any influence on national economy the question must be viewed in the broadest sense.

The common materials essential to the construction of electrical machinery have to-day reached a uniform standard necessary to the production of competitive products.

Standard specifications governing the performance of electrical machinery are in a much more advanced state than those for materials.

We are in sight of the day when long and tedious individual specifications will disappear and machinery will simply be purchased on the basis of the British Standard Specification. The effect of this on the possibilities of highly standardising the product and its natural effect in reducing the cost of production cannot be too strongly insisted upon. The V.D.E. Rules in Germany have long been established in this position, and this has been one of the most important causes of the position of Germany in the world's electrical markets.

Of equal importance with the consideration of these matters nationally is their consideration internationally. Standard international specifications will do much to lighten the burden of the British manufacturer in the export market. Often he is not in as good a position as his foreign competitor, who is a nearer neighbour, to get to know intimately the mind and ideas of a prospective customer; and the British maker is often placed at a disadvantage by tendering to the accepted British Standards, which are often more liberal than the foreign standards which might be acceptable to the purchaser.

International standards would put world competition on an equitable basis and effect economy of effort and expense which could be directed into more profitable channels.

The International Electrotechnical Commission is now sitting again regularly and the post-war equilibrium has been re-established to such an extent as to permit again of the inclusion on the Commission of representatives of former enemy countries (which, I understand, will be done at the next Conference in 1926).

This is surely the right spirit in which to approach such questions, since science and engineering, in common with art and sport, should be beyond nationality; and, in addition to this, it is sound commercial common-sense.

The terrible jumble of voltages and frequencies in this country has been one of the most serious impediments to effective standardisation of electrical machinery. Although the efforts of the B.E.S.A. and the authority of the Electricity Commissioners have at last enabled us to see daylight, we are still confronted with 45 different system voltages (excluding l.p. distribution voltages below 600 volts) and 16 different frequencies. It is noteworthy that rather more than one quarter of the total alternating-current plant installed in this country is for frequencies other than 50 cycles.

These conditions, and the relatively small demand at any one time for quantity orders for any particular system, make it impossible for the manufacturer to stock wound and finished motors, transformers, &c. The advantages of mass production as regards cost, stocking and speedy delivery are out of reach.

By way of illustration of what we have to contend with, I recently analysed orders for transformers over a period covering 1,705 transformers manufactured and aggregating 750,000 kVA. For the home market the number of different h.p. voltages was 36, and of l.p. distribution voltages 44. For the export market (covering all parts of the world, except America) the numbers were:—h.p. voltages 46, and l.p. distribution voltages 38. These figures covered a range of voltages as follows:

	H.p. volts.	L.p. volts.
Home	2,000 to 66,000	100 to 670
Export	2,000 to 132,000	100 to 600

For the same batch of orders the total number of different kVA ratings was 88 for 1-phase transformers and 97 for 3-phase transformers, the range of ratings covered being:—

1-phase, 2 to 7,833 kVA.
3-phase, 1.8 to 12,000 kVA.

Had these orders been all for standard voltages, such as those recommended in B.E.S.A. Specification No. 117, and for standard ratings in reasonable well defined steps, I estimate that the total saving in cost would have amounted to approximately 15 per cent.; and this in spite of the fact that the total kVA supplied would have been appreciably higher, by reason of selecting the nearest standard rating to the one actually specified.

Standardisation of designs of the numerous manufacturers is a field which has, as yet, been little explored. Such a proposition is likely to be regarded with suspicion or outside the range of practical policy. It is, however, quite conceivable that it may become, in the not distant future, a national necessity, to enable this country to hold its place against world competition. I have already referred to the advantageous competitive position of America and Germany in certain lines of electrical machinery and apparatus. The benefits of quantity production and resulting lower material and labour costs and the large home demand enable these countries to undersell Britain.

Particular examples to which this applies are industrial motors and small and medium sizes of distribution transformers. The total annual output of the United States in industrial motors and transformers is of the order of 10 times that of Britain: and in face of this we have in this country no fewer than 80 firms manufacturing industrial motors and 15 firms manufacturing distribution transformers (both these numbers including the large firms who make all sizes).

The position we are faced with is that all these firms carry equipment and staff for handling a great variety of sizes and types, *and none of them is manufacturing in really large quantities.*

If designs could be standardised all round and the industry so organised that work was distributed to the individual firms with reference to their equipment for the most efficient handling of each particular range of sizes and types, great benefits would accrue in cheaper cost, more efficient production, shorter deliveries, reduction of spare parts, and the prolongation of life of the harassed designer.

Such a step would not be as revolutionary as might be supposed at first sight. The design and the general construction of the standard types of electrical machinery is nowadays based on certain well-defined and similar lines for all manufacturers.

The dissemination of information through the medium of this Institution has contributed largely to this). The materials used are practically identical, being often bought from a common source.

The designer's art in standard electrical machinery has reached nearly the top of its saturation curve, as is shown by the fact that weights and efficiencies of machines of different makes are very near to one another. The only differences are in details of construction and dimensions bound up with the standard sizes of cores and tools which the individual manufacturer has adopted.

Unification of designs would not involve the revelation of any jealously guarded secrets. The designer's art to-day does not involve such issues, but is mainly a matter of designing to fit his particular shop conditions and limitations.

By way of illustration of the gain that could be effected under such a scheme, I estimate that, given a sufficient total demand in standard sizes and voltages, distribution transformers up to 1,000 kVA could be produced at from 15 to 20 per cent. lower cost.

As regards industrial motors, a writer in a recent issue of the ELECTRICAL REVIEW (who conceals his convictions on this matter under the cloak of the *nom de plume* "M.I.E.E.") estimates that a particular size of motor could be turned out at from 20 to 30 per cent. cheaper.

The gist of the matter is that co-operation is more conducive to progress than competition. Rank heresy as this may appear to some, the national aspect must be put before the parochial one. What is needed is to cut out internal national competition and combine the engineering brains and resources of the nation to meet foreign competition. Higher efficiency of production and cheaper costs are, at the moment, vital to the prosperity of the industry and of the community.

Registration of Engineers.

By the obtaining of a Royal Charter this Institution has made a great step towards the realisation of the time when all who profess and call themselves engineers must comply with a definite and high standard of qualification. One step further is, however, essential, namely, the registration of engineers by Act of Parliament. The result of registration would be that only registered persons would be permitted the use of the title "Engineer" (or "chartered electrical, civil, or mechanical engineer"), and only registered engineers would be recognised by law. The standard of entry and qualification would be made quite definite, to the benefit of the whole profession as regards the quality and efficiency of engineering work, and the status of the technical engineer. It would also aid in dispelling the appalling ignorance of the public regarding a profession on whose efforts it is dependent in one way or another for practically all its conveniences and comforts.

This country lags behind Continental countries in this matter and in Italy the registration of engineers has been carried into effect since the end of the great war. It is also of interest to note that the Royal Institute of British Architects is submitting to Parliament a Registration Bill for Architects; concurrent action by the engineering profession would appear very desirable. What is required is the setting up of a Statutory General Engineering Council (analogous to the General Medical Council) which would determine the standard of training and qualification required and would keep the register for the profession.

Technical Training.

Closely allied with this subject is that of technical training. The educational training of the technical engineer has now practically become standardised to a technical university course of three or four years, with two years of workshop training either before, after, or sandwiched.

The industry is absorbing all the students turned out, so that there is very little competition or room for selection. The industry needs more than ever the best men in order to compete with foreign competitors, whose activities are gaining in strength every year. To maintain and elevate the standard in all grades of technical occupation it is necessary to attract the best type of men and in greater numbers. Registration of engineers would ultimately conduce to this end, but meanwhile we might, with advantage, concentrate more on the means of selecting and training the best brains from all sources.

Institution Activities.

It is gratifying to note an increase in the number and variety of the papers offered to the Institution, but the number accepted as suitable for reading and discussion is still low. There is, I think, some degree of reticence in offering short and pithy papers on practical subjects, engendered by the feeling that the voluminous and classical type of paper has become the accepted standard. I think much would be gained by the reading and discussion of groups of short papers on specific subjects, presented simultaneously by a number of experts in the particular subject.

The time is over-ripe for an organised system of joint meetings between the leading engineering institutions and scientific societies, whereby the efficiency of the whole business may be improved. Many useful joint meetings have been held, but these efforts need to be systematic instead of spasmodic.

An All-Electric House.

Detailed Particulars of a 10-Room Glasgow Dwelling.

By Prof. S. PARKER SMITH, D.Sc., M.I.E.E.

(*Abstract of Paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

In 1923, the author, being in need of a house in Glasgow, a fitting opportunity offered itself to build an all-electric house. The most noteworthy feature connected with this proposal was the adverse criticism which it elicited from the majority of electrical engineers with whom the scheme was discussed; so much so, that the carrying out of such an unpopular idea must be largely attributed to the obstinacy of one who thought that the time had arrived when a professor of electrical engineering ought to have enough faith in his convictions and calculations to put them to the test. The calculations are all based on the tariffs of the Glasgow Corporation, which also arranges for the hire of electric cookers and fires. The domestic consumer is offered the choice of two alternatives:—

(1) Energy at 4½d. per kWh for M units, and ¾d. per kWh thereafter; M is based on the annual consumption for lighting and includes the consumer's share of capital and fixed charges.

(2) A two-part tariff consisting of a fixed charge to cover the consumer's share of capital and fixed charges, and ½d. per kWh for all energy taken; the fixed charge appears to be about one-eighth of the rent, and in the author's case works out at £12 10s. per annum. For the author's house M = 582, and the two-part tariff led to a saving of £7 6s. 5d. in the first year's working.

The house, in which no coal or gas is used, was built to be a home and not a showroom, an important point in determining the capital cost of an all-electric house, for in addition to the increased convenience of life obtainable with essential apparatus, there are many appliances which cannot be legitimately included under capital cost. Taking into account the fact that many appliances can be hired, the cost of the house was 3 to 4 per cent. higher than it would have been with ordinary coal and gas appliances and electric lighting.* It must, however, be remembered that the architect can effect many small savings.

An idea of the layout can be obtained from figs. 1, 2 and 3. Mr. J. Austen Laird, of Glasgow, designed the house, whilst the author was responsible for the electrical layout. There are 10 rooms—three reception-rooms and kitchen on the ground floor, five bedrooms on the first floor, and a large attic nursery. Below the ground floor there is a sloping space like a shallow cellar, 3 to 4 ft. high, which is used for much of the ground-floor wiring. There is no scullery or wash-house, the only outhouse being a garage. There are three external chimney breasts, used for ventilation. By fitting grates and replacing the ventilators by chimney-pots, coal fires could be used—a feature which calls forth the approval of many critics of the all-electric idea. There are no mantelpieces or overmantels, but fireplace recesses have been retained owing to the common practice of sitting round a fire.

Distribution Board.—Separate meters were installed for heating, hot water, cooking, and lighting; they are experimental and would not be needed for the ordinary consumer. The main meter is of the two-rate type and is actuated by a 40-day clock, so that the day and the night consumptions can be recorded separately. There are 31 heating circuits, and 5 circuits for cooking and hot water; each has its own fuses and goes to one point only, as indicated in figs. 1, 2 and 3, by H_1 to H_{17}, H_{19} to H_{30}, C_1, C_2, W_1, W_2 and W_3 (H_{18} is in the garage; H_{29} and H_{31} are in the attic nursery). These points are 15-ampere wall sockets, with the exception of the cooker and the hot-water tank which are wired for 30 amperes. The lighting distribution board is in the housemaid's closet on the first floor (fig. 2) and feeds four circuits. The main distribution board is between the hall and cloak-room.

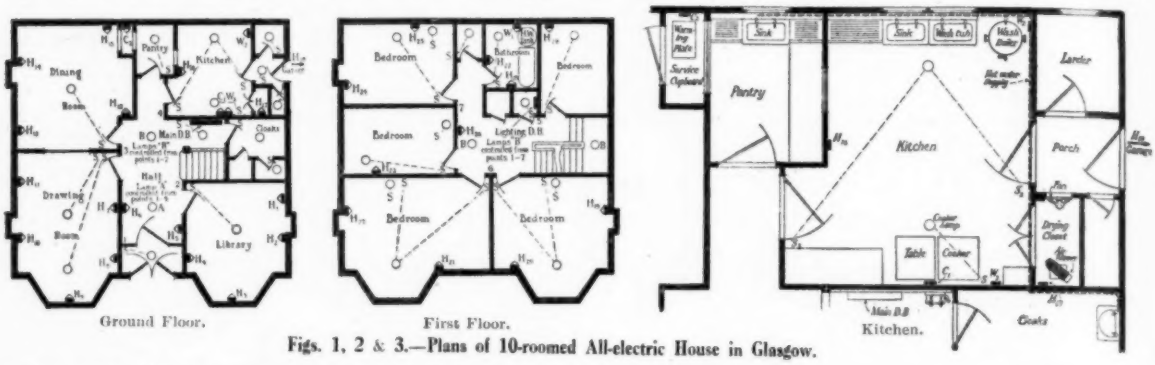
Wiring.—In general, the regulations of the Institution were adhered to and rubber sheathed cable (c.t.s.) was used; nothing has yet occurred to make the author believe that it was not the cheapest and the best solution. The supply is direct current at 250 volts, the positive and neutral being brought to the house.

Switch-sockets are used throughout, of the 15-ampere, 3-pin, flush pattern with a mechanical interlock to prevent the plug being removed with the switch on, or switching on before inserting the plug. With few exceptions, switch-sockets are in-

serted in the skirting board and the switches are arranged to be put on or off by the foot. The object in employing sockets all of the same size is to enable all fires and other appliances to be used wherever desired. The author's experience has shown that in the living rooms 4 to 5 points per room are desirable. In certain places it has been found convenient to duplicate some of the points by using a 15-ampere plug with a 5-ampere adapter.

Bells.—In order to have the bell circuits as sound as the lighting and heating circuits, c.t.s. wire was also used.

Lighting.—The charge for lighting comes to about nine shillings per quarter, consequently abundant lighting everywhere is permissible. Relatively, therefore, the cost of lamps is an important factor; indeed, this may be a case where underrunning lamps (*i.e.*, running lamps at less than the rated voltage) may be sound policy for the user. Wherever it is desirable to operate a light from more than one point, suitable switching is provided and the convenience of being able to control the stair lights from 7 points can scarcely be exaggerated. In the kitchen an additional strong light is placed over the cooker and all the switches are of the flush pattern; exposed or unshaded filaments are avoided throughout the house.



Figs. 1, 2 & 3.—Plans of 10-roomed All-electric House in Glasgow.

Clothes Washing and Drying.—In Glasgow a wash-tub is often fitted alongside the sink, and a small wringer with rubber rollers can be readily attached. Alongside the enamelled tub a wash-boiler of the percolator pattern has been placed (see fig. 3); the loadings are 2 kW, 1 kW and ¼ kW. Articles, after being soaped, are placed in this boiler, no preliminary scrubbing being necessary, as the washing is done by the continuous circulation of the boiling water. Unpleasant steaming is avoided by controlling the heat, and after bringing the water to the boil the process is usually completed in half an hour with the rotary switch on "low."

Drying facilities become essential in a wet climate. For this purpose, the drying-closet shown in fig. 3 has been provided. The clothes are hung over wooden rods, while an exhaust fan draws air from the space below the floor, which passes over an air warmer of the convector type, rated at 1½ kW. After an hour the dried clothes come out as fresh as if they had been hung out in sunshine.

Cooking.—Electric cooking well merits the success it has gained and it is probable that much less will be heard of the "nasty smell of cooking throughout the house." The thermometer on the oven door and the clock enable results to be obtained which will be particularly appreciated by the growing number of refined women who have to do their own cooking. Indeed, the splendid results obtainable may make cooking attractive to many intelligent people.

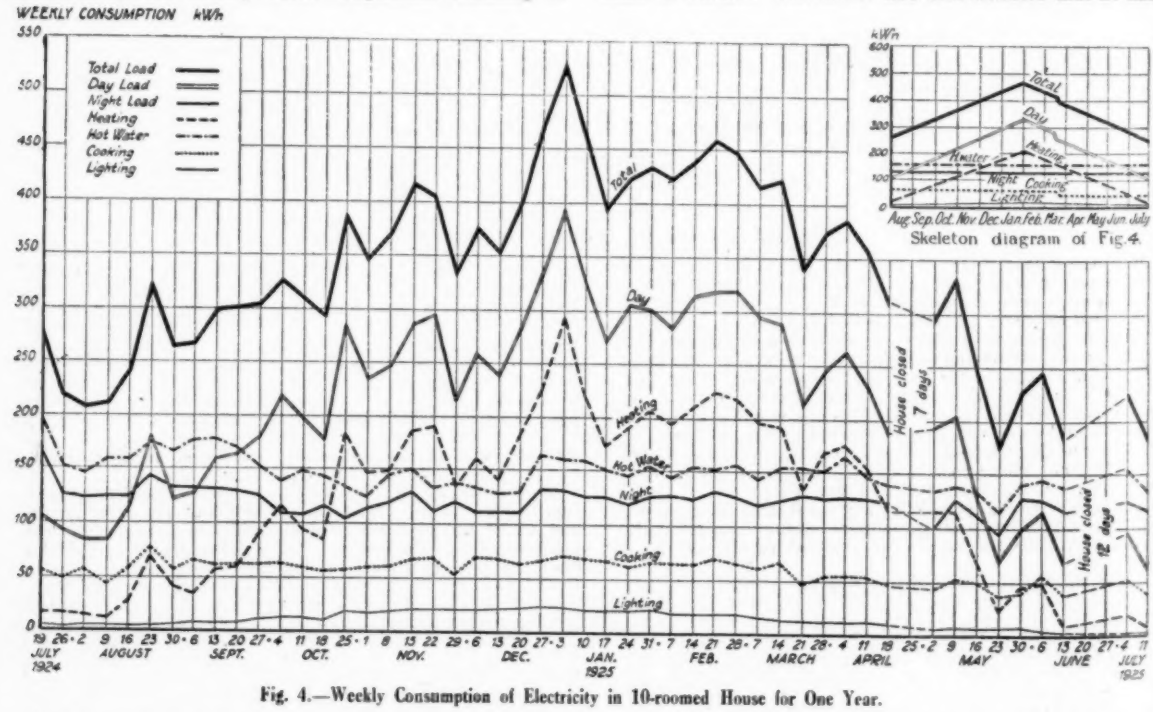
The cooker is of the table type with the oven alongside the boiling-table. This avoids stooping and the oven and griller can be given unstinted praise. The two boiling-plates are rated at 1½ kW and 2 kW respectively and are of the open type. Though satisfactory when properly maintained, manufacturers must try to do better with their boiling-plates; the efficiency of the open-type boiling-plate may be 20 to 25 per cent. when starting from cold, or little better than that of a coal fire. Numerous experiments by the author have shown that substantial improvements are possible—see "cooking" load curve, fig. 4, showing the fall in consumption—and no one will be better pleased than supply undertakings when makers can improve the efficiency and reduce the upkeep charges of boiling-plates.

Probably in some households it would be better to provide three boiling-plates on the boiling-table, while large and small ovens might be an advantage. It has been found that rustless steel makes excellent baking shelves for ovens.

(To be concluded.)

Discussion in London.

Col. R. E. CROMPTON opened the discussion by pointing out that the author had had an efficient partner in the City of Glasgow Electricity Department; he wished that they had the same in London. The author had demonstrated that he had



Skeleton diagram of Fig. 4.

Fig. 4.—Weekly Consumption of Electricity in 10-roomed House for One Year.

great knowledge of what was required to make an all-electric house a successful proposition. The paper taught much, but it should be remembered that there was a great deal of difference between the conditions that governed the supply of cheap electricity in residential cities as compared with industrial districts. The author had condemned imitation, but he had not abandoned it entirely himself, for he still retained fireplaces in which to stand his radiators. It was not only wrong, but positively wicked to use a coal fire in a bedroom; a large proportion of fog was due to bedroom fires, because bedrooms being on upper floors, the chimney draught was very bad. The use of portable electric heaters enabled the heat to be directed just where it was re-

quired; they were ideal for bedroom use, and even in London were cheaper than the coal fire. By using a small radiator under the table one could work in a cold room very much more comfortably and efficiently than if other means of heating were used. He had tried to be fair in these matters—he had conferred with the gas people, and invented a coal fire himself which cost 2s. a week to run, and heated a 16-ft. room, the coal he used being the same as that burnt in power stations. It was all very well for the author to say that the Glasgow Corporation supplied him with electricity cheaply, but if 1,000 houses instead of one were supplied at those rates, the Glasgow accounts would undoubtedly show a loss.

Dr. S. Z. DE FERRANTI considered the subject was of immense importance to the community, and the outstanding feature of the paper was the faith of the author in his scheme. The equipment of his house would enable him to live with a very much greater degree of comfort than he could possibly do otherwise, but the greatest disadvantage was the lack of means of disposing of refuse; he had installed a destructor in his own house. After pointing out the advantages of radiant heat, he expressed the opinion that in a dwelling-house, anything which heated the air should be strictly avoided. A certain amount of cool air was necessary for the maintenance of good health. There was no question of loss of money in this matter; no matter how many houses were similarly equipped to the author's, the Glasgow Corporation would still want more. Mr. Mitchell knew what he was doing. Unfortunately electricity was dear in many places, due to poor load factor and the overrating of undertakings, &c. Hot water was a cheap method of storing energy at night, and development on some such lines would do much to solve their electrical troubles. The cost of £43 per annum mentioned by the author, paid Glasgow handsomely, and a similar service could not have been rendered by other means without costing several times that figure. A public supply of electricity was not available where he lived, and he therefore installed a crude-oil engine generating plant and batteries. The total load for the 27-roomed house was about 18 kW, and for some months now he had used no coal or gas whatever. The exhaust heat from the engine and that in the water jacket was stored for use in the house. Water pipes at a temperature of about 110 deg. F. embedded in the ceiling plaster, together with electric radiators, was the means of heating the principal rooms. The only combustion was in the cylinder of the engine, and the heat efficiency of such an installation was very high.

Miss A. E. HASLETT remarked that a feature of the author's house was its labour-saving qualities. She had been privileged to visit it, and the thing that surprised her most was the fact that when she was shown into the kitchen at the busiest time of the morning, she found the maid wearing headphones and sewing. Engineers were now coming into the home, and they would have to seek the woman's point of view before they got very far. Cheap domestic labour had gone for ever, and must be replaced by mechanical means, but the prevalent public idea that electricity was too dear and difficult to manage, must be corrected. Only the other day she was talking to a University educated woman who would be normally regarded as an intelligent person, but who was not aware of the fact that electricity produced heat as well as light. The success of electricity in the home would need a very much greater maintenance service than anything yet contemplated, and also regular inspection by persons who would take a real interest in the installation. The retention of the coal fire was merely a custom. The author had said a good deal about cheap electricity in Glasgow, and she would like to mention that in her own all-electric flat in St. Marylebone, she obtained her electricity for ½d. per kWh, light being a "gift," as was the case in the author's house. London was not so far behind as they had been led to believe. She thought it was about time that an electric kettle was produced which would heat water as quickly as it could be heated by gas.

Prof. A. H. BARKER could not agree with all the views that had been expressed. He would have liked the author to give more details about the size of windows, thickness of walls, &c., these having an important bearing on his heating scheme. The heating of water by electricity could only be advocated by a man who was so keen on the subject that he lost sight of the end. Apart from Dr. Ferranti's idea, which was attractive, it was impossible to get more than 20 per cent. heat efficiency in the house when electricity was used, whereas a much higher percentage was possible by other means, and the gas people were only destroying about half as much coal as the electricians.

Major E. O. HENRICI spoke from the point of view of the cost to the consumer, comparing his own house with that described in the paper. By using coal, gas, and electric lighting, his average cost for the last three years was £50 per year, but the installation was old and inefficient. It therefore seemed to be possible for electricity at ½d. per kWh to compete with other means of heating, but it would not be possible for him to dispense with one maid, even if he had an all-electric house. In his own house the cost would have been considerably if a modern heater had been introduced; an electric heater was, however, three times as efficient because the heat could be used just where it was required. If the author's house had been built in his (the speaker's) district, the annual running cost would have been about £100.

Dr. MARGARET FISHENDEN said that in her own house, using gas and coal, the annual cost was £44, which indicated that electricity at ½d. per kWh could compete in ordinary houses; but it must be remembered that such houses were old, containing inefficient equipment. The author could have saved £9 per year if he had used an independent coke-fired boiler for water heating. She appreciated the value of radiant heat, but cold walls were by no means comfortable. She was very much surprised at the author's figures of the efficiency of electric boiling rings. The great discrepancy between his figures and those of manufacturers showed something to be wrong somewhere.

Mr. W. NOBBS explained that radiant heat from the sun could not be compared with that of a fire. The size of the sun and the angle of incidence were such that a person standing in sunlight was completely surrounded by warmth, whereas a fire (very much smaller and nearer) only directed heat on one spot. He had lived for about 15 years in houses warmed by convectors, with great comfort; radiant fires should only be used to supplement the former method. The creation of a night load by hot water storage only went part of the way. The wide fluctuations of the demand for water from day to day indicated that the average demand could only be efficiently met by electric heating at night.

Mr. L. J. GOOCH said that it had always been his ambition to live in an all-electric house, but the lack of an electric fire which could compare with a coal fire prevented many would-be users of electricity adopting such a scheme.

Dr. S. PARKER SMITH replied very briefly, and the President, on account of the shortness of time, asked intending speakers to send in their contributions for publication in the I.E.E. *Journal*.

New Electrical Proposals for Parliament to Consider.

We publish below a list of proposals that will come forward in the next session of Parliament (1926). Readers who are desirous of obtaining further information will find the notices published in full in the *London Gazette* for November 20th, 24th, and 27th.

(a) Electric Light and Power.

Oldham Corporation.—Powers to extend the area of the borough so as to include the urban district of Chadderton and to extend the Corporation's limits for the supply of electricity so as to include the added area and to alter or repeal the powers of the Lancashire Electric Power Co. to supply electricity therein; further financial powers, &c.

Ascot District Gas and Electricity Co.—Authority to raise additional capital both for gas and electricity purposes, such capital to form part of the general capital of the company, &c.

Horley District Gas Co.—Powers to supply electricity in the parishes of Horley, Newdigate, Burstow, Horne, and Nutfield, and a portion of the parish of Charlwood in the rural district of Reigate, a portion of the parish of Upper Beeding, the parishes of Rusper and Crawley, in the rural district of Horsham, and a portion of the parish of Worth, in the rural district of East Grinstead.

Authority to erect a generating station, to manufacture and supply fittings, &c., to supply electricity in bulk, to change the name of the company; further financial powers, &c.

Leicestershire and Warwickshire Electric Power Co.—Further financial powers; provision for the conversion or division of the shares in the authorised capital of the company; authority to apply for special or other Orders under the Electricity (Supply) Acts, 1882 to 1922; removal of restrictions upon the placing by the company of electric lines above and below the surface of the ground; to provide that electricity supplied by the company within its area of supply to the owners, &c., of any railway, tramway, dock, harbour, and canal undertaking may be used for all or any purposes of any part of such undertaking whether within or without such area of supply, &c.

Milford Docks Co.—Authority to supply electricity to Milford Haven Urban District Council, to lessees and occupiers of property of the company, and to owners, lessees, and occupiers of adjacent property, &c.

Halifax Corporation.—Further powers in connection with the electricity undertaking; additional powers with reference to the tramway, trolley vehicle and omnibus undertakings; further financial powers, &c.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—Powers to provide for the merger of the company and the sepearate undertaking of the company; to annul the resolution constituting the separate undertaking; to annul two agreements made between the company, the separate undertaking and the Halesowen Lighting and Traction Co., Ltd.; to vary the terms of the agreement of November 1st, 1922, made between the company and H.M. Treasury Commissioners; provision as to contracts and other instruments, &c., relating to the separate or the general undertaking; to annul

certain ordinary shares in the capital of the separate undertaking issued to the Halesowen Lighting and Traction Co., Ltd., and held by that company as nominees; to annul certain capital and borrowing powers of the separate undertaking; further financial powers, powers to relieve the company from the obligation to keep separate accounts of its undertakings, powers to invest in the shares, &c., of other companies and bodies; authority to manage the undertaking or generating stations of other undertakings; to extend the company's powers of selling or purchasing electricity in bulk and of laying electric lines for the purpose; powers to acquire by agreement the undertakings of other undertakers; to incorporate, repeal, and amend certain Acts, &c.

Metropolitan Electric Supply Supply Co., Ltd.—Powers to extend the area of supply as defined in the Metropolitan Electric Supply Co. (Various Powers) Act, 1905, as extended by the Metropolitan Electric Supply Co.'s Act, 1906, so as to include the following areas:—

IN THE COUNTY OF BERKS.—The county borough of Reading, the borough of Wokingham, the rural districts of Cookham, Easthampstead, and Wokingham, and parts of the rural district of Bradfield.

IN THE COUNTY OF BUCKS.—The rural district of Hambledon and parts of the rural district of Wycombe.

IN THE COUNTY OF OXFORD.—The borough of Henley-on-Thames, the urban district of Wheatley, the rural districts of Crowmarsh, Goring, and Henley, and parts of the rural districts of Culham, Headington, and Thame.

IN THE COUNTY OF SOUTHAMPTON.—The boroughs of Aldershot and Basingstoke, the urban districts of Alton, Farnborough, and Fleet; the rural districts of Hartley Witney and Alton; and parts of the rural districts of Basingstoke and Petersfield.

IN THE COUNTY OF SURREY.—The boroughs of Godalming, Guildford, Kingston-upon-Thames, Reigate, Richmond, and Wimbledon; the urban districts of Barnes, Caterham, Dorking, East and West Molesey, Epsom, Esher and the Dittons, Farnham, Frimley, Ham, Haslemere, Leatherhead, the Maldons and Coombe, Merton and Morden, Surbiton, Walton-upon-Thames, Weybridge, Windlesham, and Woking; the rural districts of Dorking, Farnham, Godstone, Guildford and Hambledon; and parts of the rural districts of Chertsey, Epsom, and Reigate.

Powers to supply electricity in bulk to local authorities, companies, bodies, or persons authorised to give a general supply of electricity within the area of supply comprised in the extension of districts above mentioned.

To authorise the company to supply electricity to persons requiring a supply for power within the added area and within the existing area, consisting of the district defined in the said Acts, which comprise the following:—

IN THE COUNTY OF BERKS.—The boroughs of Maidenhead and New Windsor and the rural district of Windsor.

IN THE COUNTY OF BUCKS.—The borough of Chepping Wycombe; the urban districts of Beaconsfield, Chesham, Eaton, Marlow, and Slough; the rural district of Eton and parts of the rural districts of Amersham and Wycombe.

IN THE COUNTY OF HERTFORD.—The urban districts of Chorleywood and Rickmansworth and part of the rural district of Watford.

IN THE COUNTY OF LONDON.—The metropolitan boroughs of St. Marylebone, Hampstead, and Fulham.

IN THE COUNTY OF MIDDLESEX.—The boroughs of Acton and Ealing; the urban districts of Brentford, Chiswick, Feltham, Greenford, Hampton, Hampton Wick, Hanwell, Harrow-on-the-Hill, Hayes, Heston and Isleworth, Kingsbury, Ruislip-Northwood, Southall-Norwood, Staines, Sunbury-on-Thames, Teddington, Twickenham, Uxbridge, Wealdstone and Wembley, and the rural districts of Hendon, Staines, and Uxbridge.

IN THE COUNTY OF SURREY.—The urban districts of Chertsey and Egham, and parts of the rural district of Chertsey.

Powers to make provision as to the purposes for which electricity supplied for power may be used, and for charging for electricity supplied under the intended Act. Powers to construct sub-stations; to constitute the company a power company; further powers as to the supply of electricity in bulk, &c.

London Power Co.—Power to construct a generating station on lands in the urban district of Heston and Isleworth for generating and transforming electricity, power to acquire land and erect and use electric lines, &c., within the borough of Richmond and in the urban districts of Brentford and Heston and Isleworth, to construct, place, and use electric lines and other apparatus for the transmission of electricity within the metropolitan boroughs of Fulham and Hammersmith and in the boroughs of Acton and Ealing and the urban districts of Brentford, Chiswick, Greenford, Hanwell, Heston and Isleworth and Willesden.

To make provision as to the application by the company for Orders under the Electricity (Supply) Acts, 1882-1922.

Bristol Corporation.—Authority to use, for the purpose of a generating station, certain lands in the urban district of Portishead in the county of Somerset; to apply to the electricity undertaking of the Corporation the provisions of the Electric Lighting (Clauses) Act, 1899, in lieu of the provisions of the Bristol Electric Lighting Order, 1883; further powers in connection with the electricity undertaking; powers to extend the boundaries of the city and supply area so as to include part of the urban district of Portishead, in the county of Somerset, and of the parish of Henbury, in the rural district of Thornbury, in the county of Gloucester; other provisions, &c.

Hackney Borough Council.—Powers to construct in connection with the electricity undertaking an intake and screening chamber on the southern bank of the Hackney Cut navigation; to abstract water from the Hackney Cut navigation for condensing and other purposes; to apply some or all of the provisions of the Electric Lighting (Clauses) Act, 1899, to the electricity undertaking; further powers, including the construction of sub-stations under streets, the fitting-up of showrooms and offices, and the giving of demonstrations of electrical appliances; further powers, &c.

Guildford Corporation.—Further provisions with regard to the electricity undertaking, including the establishment of showrooms, &c., the allowance of discounts, &c., financial provisions, &c.

Mynyddislwyn Urban District Council.—Further provisions with reference to the electricity undertaking, &c.

(b) Electric Tramway, Motor-'bus and Trolley Vehicles.

Ramsbottom Urban District Council.—Powers to maintain and run motor omnibuses within and beyond the district; further provisions with regard to the existing tramway and trolley-car undertaking, including the increase of fares; further financial powers, &c.

Swindon Corporation.—Powers to run omnibuses within and beyond the borough; further powers with reference to the tramway undertaking; powers to extend the area of supply of electricity by the Corporation by the addition thereto of the parish of Rodbourne Cheney, in the rural district of Highworth, in the county of Wilts.; powers to provide showrooms, &c.; further financial powers.

Birkenhead Corporation.—Powers to run omnibuses within a radius of five miles from the Town Hall; further powers with reference to the tramway undertaking; additional financial provisions, &c.

Darwen Corporation.—Authority to construct new tramways, to provide and run trolley vehicles, to provide and run omnibuses within and outside the borough; further powers with reference to the tramways and electricity undertakings; additional financial powers, &c.

Doncaster Corporation.—Powers to provide and run trolley vehicles on certain routes; further powers with reference to the electricity undertaking, including the supply of electrical fittings.

Leicester Corporation.—Powers to construct and work certain new tramways; further provisions relative to existing tramways; further financial powers, &c.

Hartlepool Corporation.—Authority to equip and work trolley vehicles along certain routes; powers to abandon the tramways along these routes; authority to purchase from the West Hartlepool Corporation the overhead equipment and other works constructed in the borough by it under the provisions of the West Hartlepool Corporation (Trolley Vehicles) Order, 1925; further powers in connection with the running of trolley vehicles in substitution for tramcars; additional financial provisions.

Kidderminster and Stourport Electric Tramway Co.—Powers to construct new tramways and reconstruct certain existing tramways; powers to run omnibuses, &c.

Mexborough and Swinton Tramways.—Powers to provide and run trolley vehicles on certain additional routes; further provision with regard to the tramways and trolley vehicles, &c.

Rhondda Urban District Council.—Extension of time for the construction of tramways authorised by the Act of 1915.

East Ham Corporation.—Powers to run trolley vehicles within the borough; further provisions with regard to the tramway undertaking; additional provisions as to the supply of electricity and with regard to the electricity undertaking, including the establishment of showrooms, methods of charging, &c.

Colwyn Bay and Colwyn Urban District Council.—Powers to run omnibuses within the district; further powers with regard to the electricity undertaking.

Worcester Corporation.—Powers to acquire the existing tramways and light railways of the Worcester Electric Traction Co., Ltd., in the city, and to work the said tramways and light railways, &c.; authority to abandon and remove the said tramways and light railways, and to run trolley vehicles; powers to run trolley vehicles within and beyond the city; further provisions with regard to the tramways and light railways, &c.

Southend-on-Sea Corporation.—Powers to run trolley vehicles; further provisions with regard to the electricity undertaking, &c.

(c) Railways.

London Electric and Metropolitan District Railway Companies.—Powers to construct subways, improve, extend, and rebuild certain stations, &c.; extension of time limits for construction of certain railways authorised by the London Electric Railway Act, 1914; additional financial powers, &c.

Metropolitan Railway.—Powers to construct and work by electrical energy a railway in the urban district of Willesden and the metropolitan boroughs of Hampstead, Paddington, and St. Marylebone, &c.

Kearney High-Speed Tube Railway Co., Ltd.—Powers to construct a light railway in the county boroughs of Tynemouth and South Shields.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A Waste-Heat Boiler.

The present-day necessity for economy, particularly in the use of fuel, creates a favourable opportunity for the practical application of Dr. Nicolson's theories with regard to waste heat and gases to the design of boilers for utilising the heat in the flue gases from metallurgical furnaces, gas retorts, or from internal combustion engines. Such a boiler, made by MESSRS. JOSEPH ADAMSON & Co., Hyde, Cheshire, is shown in fig. 1. It is designed with a view to the length and speed of travel of the hot gases across the heating surface exactly suiting the temperature and volume of the hot gases available, so that they will not leave the boiler at too high a temperature. It is of the flame tube type, constructed, it is claimed, in accordance with the best marine practice; the endplates are secured in the steam space by screwed bar stays of ample section and in the water space by special stay tubes, of thicker material than the others, screwed and expanded into both endplates. The feed water is controlled by a patent marine type regulator, which, it is claimed, will maintain the water level under widely varying load conditions. The heating surfaces

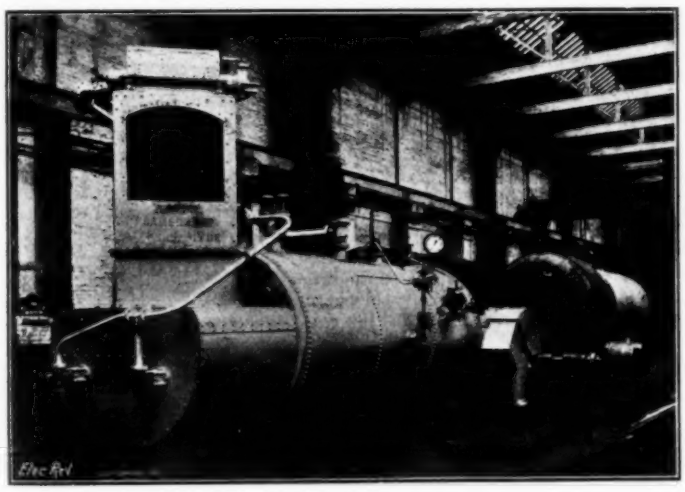


Fig. 1.—Waste-Heat Boiler.

are kept free from soot and other impurities carried in suspension by the gases, by the aid of a blower of the steam jet type, so arranged that all the tubes in the boiler are thoroughly scoured by a high-velocity jet of combined steam and flue gas. The working of the blower does not interfere with the normal

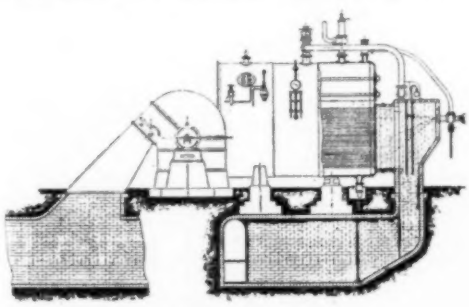


Fig. 2.—Method of Installation.

operation of the boiler, and the time occupied to clean a large boiler is only a few minutes.

It is estimated that a waste heat boiler on a soaking pit provides about 4,000 lb. of steam per hr., representing, say, 2,000 tons of coal saved per annum. The draught fan is electrically driven and for a boiler of this capacity a 20-h.p. motor is installed.

Fig. 2 shows the method of installation of the boiler with regard to the flues.

We suggest that such a boiler may meet the requirements necessary to make use of the waste heat from the small gas works in the country town, &c., for the generation of electricity. From the above estimated figures it may be assumed that a considerable plant for the generation of electricity could be adequately supplied with steam from such a source.

An Improved "Frog" for Overhead Trolleys.

A new design of overhead trolley "frog" has been recently introduced by the Westinghouse Electric & Manufacturing Co. of East Pittsburgh, U.S.A. In attempting to overcome the difficulties encountered in the use of the open-pan type of frog, many modifications of design have been introduced, some of which have operated effectively for trolleys working from the tangent to the curve, but have failed in the reverse direction, the wheel invariably leaving the frog due to the use of a 15 deg. angle. For perfect transition it was found that the correct angle was 8 deg., but such curves were found unsuitable in practice. It is claimed that the new design, which embodies a combination of the 8 deg. and the 12 deg. angles, permits of perfect transition from the tangent to the curve and *vice-versa*. One of its features is that the wheel flanges do not touch the pan, thus giving it a longer life. Flexible approaches are another feature, eliminating the hammer blow as the wheel approaches the body of the frog and doing away with the old method of holding the frog by the use of stove bolts. The bayonet approaches firmly hold the trolley wire, the sides of the approach interlocking with the prongs on the runner, and so providing a high safety factor and ease of installation.

A New Furnace Repair Gun.

The accompanying illustration, fig. 3, is of a new device in the form of a portable furnace repairing gun, which, according to *Combustion*, has been recently developed by the QUIGLEY FURNACE SPECIALTIES CO., INC., for relining, patching, or surfacing furnace walls speedily and economically. Refractory materials of plastic consistency to conform with the best-known refractory practice of to-day in the maintenance of boiler and furnace walls are applied with the machine by means of compressed air. The pre-mixed material is placed in the gun; the nozzle is then pointed at the place to be repaired, and the mixture is forced through the hose and nozzle. A pressure of from 95 to 100 lb. is required for heavy plastic mixtures, and for thin mixtures it can be operated with a pressure of 50 lb. The gun consists of a cast-iron cylinder from which the material is forced by pressure applied to the piston. The material is placed in the gun at the charging opening A in the top. Pressure is applied at the bottom of the piston through the pipe connection P, and controlled by the valve B. As the piston rises, the mixture is forced into the Y connection C, from which point it is carried through the hose by pressure of the piston and through the valve D. The gun has a capacity of 2 cu. ft. of mixed material.

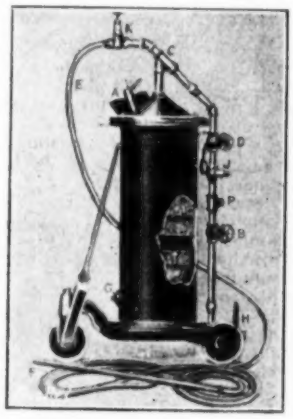


Fig. 3.—Furnace Repair Gun.

A Low-Loading Cable Trolley.

BRITISH INSULATED & HELSBY CABLES, LTD., has recently had constructed by Messrs. R. A. Dyson & Co., Ltd., Grafton Street, Liverpool, a trailer for the transportation of cable drums, a feature of which is that the frame level is only 5 in. from the ground, thus greatly facilitating the handling of the heavy drums. The trailer, which is of all-steel construction throughout, will be used in conjunction with a small tractor. The body which it carries is 8 ft. 2 in. long, the overall length being 10 ft. 6 in. and the width 3 ft. The axles are fitted with roller bearings and carry steel disk wheels fitted with rubber tires. Four vertical spiral springs are mounted on top of the solid axles in order effectively to damp out road shocks. The front axle is of the Ackerman steering type, and a locking arrangement is fitted in order that the trailer, which will carry loads up to 3 tons, can be reversed with ease and safety.

London's Electricity Supply in 1923-24.

The L.C.C. Annual Report.

THE annual review of electricity supply in the London and Home Counties Electricity District for the year 1923-24, compiled by the London County Council,* is again replete with matter of the greatest interest and importance. In studying the report it has to be remembered that the year ends with March 31st, 1924, for local authorities and with December 31st, 1923, for companies; also that since the compilation of the report the Watford area has been excluded from the District. There is still another report to come before the record of the operation of the new Joint Electricity Authority commences.

The last census (1921) gave the population of the area as 8,168,819 in an extent of 1,797 square miles. Since the last returns the number of electricity supply authorities has been increased by one (the Chesham Electric Light & Power Co., Ltd., which commenced to supply in Amersham in September last) to 89. This gives the companies, 45 in number, a majority of one. The figures include three local authorities and one company (apparently that already mentioned) not actually giving a supply, and exclude one company (the Central Electric Supply Co., Ltd.), which is a bulk supply company only. The second part of the returns deals with bulk supply arrangements between various authorities. From this the authorities who had made agreements but had not exercised them appear to have been deleted. Apart from this the position appears to have been altered but little except that the total amount of energy interchanged increased by over 48 million kWh to about 201 million kWh. The North Metropolitan Company transferred its custom from the London Electric Railway Co. to Luton Corporation and took a larger quantity. The third section of the report merely shows the local government areas and the authorised distributors therein. The principal part of the report commences with Section 4, in which are tabulated the statistics relating to the capacity and output of all undertakings. A comparison with the previous report shows that the total capacity of generating plant installed at the end of the year rose from 675,532 kW to 758,477 kW—an increase of about 12.3 per cent. The capacity of local authorities' plant was 357,182 kW (14.7 per cent. increase), while that of the companies' plant rose by about 10 per cent. to 401,295 kW. At the same time transforming plant used in connection with bulk supplies increased by only 2 per cent. to 131,000 kW, there being a slight decrease in the amount of such plant employed by local authorities. The latter undertakers had a total of 215,510 consumers at the end of the year, as against 188,399 a year earlier, and the companies were supplying 225,757†, as compared with 219,401; so that the total number of consumers (subject to the proviso in the footnote) rose by about 8 per cent. to 441,267. The municipalities' maximum load was 236,756 kW and the average load factor 23.1 per cent., as compared with 204,432 kW and 22.5 per cent. in 1922-23. The equivalent figures for the companies were 313,512 kW and 20.3 per cent., as against 238,039 kW and 20.4 per cent. in the preceding year. The total maximum demand was thus 550,268 kW, as compared with 442,471 kW, and the overall load factor 21.6 per cent. as against 21.4 per cent. The kW equivalents of connections were as follows:—Municipalities: 1922-23, 586,790; 1923-24, 607,408. Companies: 1922-23, 691,988; 1923-24, 710,317.

Table 5 records the number of kWh generated, sold, &c., by each undertaking. The local authorities generated or purchased during the year (deducting intersales) 535,564,241 kWh, as compared with 449,684,678 kWh in 1922-23, while the companies' output rose from 479,127,973 kWh to 541,347,298 kWh; thus the total output rose from 928,812,651 kWh to 1,076,911,539 kWh. The sales closely followed the output, being 80 per cent. of the energy generated in the case of the local authorities, 79 per cent. in the case of the companies, and 79 per cent. overall; these figures remained stationary from the previous year.

Table 6 analyses the accounts of the undertakings in a very thorough manner. So far as the municipalities were concerned the total capital expenditure during the year was £1,453,659, bringing the total up to £17,936,726. The companies' capital expenditure rose by £1,906,839 to £26,253,452. It is interesting to compare the capital expended on buildings and plant with that employed for the purchase of cables and meters. In the case of the municipalities the respective amounts were £8,986,156 and £6,594,088; and with regard to the companies £14,535,404 and £10,786,253. Turning to the analysis of the trading accounts, it is seen that the municipalities recorded a total revenue from all sources of £4,202,706, as compared with £4,146,837 in 1922-23 The total of working expenses rose from £2,027,334 to £2,221,441. Thus the ratio of working expenses to receipts rose from 49 to 53 per cent. After meeting taxation and other expenses, the balance remaining to meet capital charges was £1,782,209 (as against £1,950,888). These charges amounted in the aggregate to £1,573,620 (£1,533,278), and the net profit was therefore £208,589 for the forty-four undertakings. A net contribution of £195,488 was made to rates. The companies' accounts show a total revenue of £6,127,194, an increase of £270,850, and working expenses totalling £2,433,369 (as against £2,465,868), reducing the ratio of expenses to revenue from 42 to 40 per cent. The amount remaining to meet capital charges, after deducting taxation, &c., was £3,728,939 (as compared with £3,212,113), and these charges, comprising interest, dividends, reserves, &c., aggregated £3,467,863† (£3,001,872*).

Table 7 sets out the average rates of interest and dividend paid by the sixteen companies operating in the County of London for each of the past 24 years. These figures show that the overall average rate fluctuated between the limits of 4.60 per cent. and 5.79 per cent. from 1900 to 1919; since the latter year the rates have been as follows:—1920, 6.02 per cent.; 1921, 6.22 per cent.; 1922, 7.10 per cent.; 1923, 8.07 per cent. In 1923 only three of the undertakings paid a lower rate than 6 per cent., *viz.*, the Charing Cross Co. (City Undertaking), 5.98 per cent.; the Kensington and Knightsbridge and Notting Hill Joint Station, 4 per cent. (a fixed dividend); and the Central Co., 4.91 per cent. Five undertakings distributed over 10 per cent., *viz.*, the Brompton and Kensington Co., 12.94 per cent.; the Notting Hill Co., 16.08 per cent.; the St. James' and Pall Mall Co., 10.50 per cent.; the South London Corporation, 11.26 per cent.; and the Westminster E.S. Corporation, 10.58 per cent. Statement 8 shows that the London companies had realised premiums totalling £963,022 upon the issue of new capital up to the end of 1923; the bulk of this (£674,226) was transferred to renewal, reserve, &c., funds.

Table 9 is a statement of the capital expenditure of the London undertakings (company and municipal) during each of the six years ended with the period under review, *i.e.*, from 1918-19 to 1923-24. In the case of the municipalities the expenditure for the six years totalled £11,472,164, and that of the last year £1,076,129. The companies expended £20,989,502 in the six-year period and £1,838,797 in 1923.

In statement 10 these London authorities are set out, irrespective of the class to which they belong, in order of age, to show what provision has been made for depreciation or its equivalent. The net expenditure charged to capital account is shown, and this is followed by statistics of charges met out of revenue or premiums, the writing-off of preliminary expenses, &c., the totals of various reserve funds, and the repayment or provision for repayment of loans. Among the outstanding items in this section are the following:—The County of London Co., which with a net capital expenditure of £3,072,167 has a total of the other items mentioned above of £1,702,151; the Metropolitan Co. shows a net expenditure of £3,008,188, and a total of reserves, &c., of £1,905,698; the City of London Co. has a net expenditure of £2,783,072, the other items totalling £1,615,419; the Woolwich Borough Council has been aided by the rates to the extent of £253,809; for the Hampstead Borough Council a net expenditure of £349,367 is shown, while the total before-mentioned is £551,121. The latter amount includes £236,218 applied to replacements or purposes of a capital nature, and £276,056 repayment of loans (including provision for this). The operations of refuse-destructor undertakings are dealt with in Table 11. There are six of these and details for Fulham, Hackney, Poplar, Shoreditch, and Stoke Newington are given. For the Woolwich undertaking no figures were available. Full particulars are given only in the cases of Poplar, Shoreditch, and Stoke Newington, and it is shown that these three undertakings generated 1,213,656 kWh, 319,470 kWh, and 246,698 kWh respectively, and charged 0.378d., 0.461d., and 0.240d. per kWh.

The financial results of each of the undertakings belonging to metropolitan borough councils from its inception to March 31st, 1923, are detailed in Table 12. There are 16 undertakings in the list and of these three (Bermondsey, Southwark, and Woolwich) show a deficit over the period of their existence. The remainder show aggregated profits of various dimensions and the net result of the whole 16 is a profit balance of £498,396. The net contribution to the rates has been £134,991.

(To be continued.)

* P. S. King & Son, Ltd. Price, with maps, 5s.
† Incomplete totals.

Electrical Developments in Switzerland.—In this country of "white coal" the use of electrical energy continues to increase, and a whole series of power stations have either been or are being erected or enlarged, involving the expenditure of many millions of francs. At Waggital the plant was to be extended by about 162,500 h.p., while a 10,000-h.p. plant was to be installed at Klosters and linked up with the power stations in the Grisons. In the canton of Valais, two stations at Oberems and Tourtemagne were to be established to produce 30,000 h.p. The Martigny-Orsières is constructing a station at Orsières with an output of 30,000 h.p., and the power houses at Chancy-Pougny will furnish 29,000 h.p. In German-Switzerland fresh stations are about to be built at Sufers-Andeer, the favourite summer resort Andeer-Sils, on the Upper Rhine at Niederschworstadt, Dogern and Reckingen; and at Ruperswil, Wildegg-Brougg and Bottstein, as well as other stations in the Rhone basin.

The North Wales Dam Burst.

Report of the Coroner's Inquest.

ON December 1st the inquest conducted by Mr. J. P. Williams, Coroner for North Carnarvonshire, on 11 of the 16 lives lost due to the breakdown of the dam at Lake Eigiau on November 2nd, was concluded. Mr. W. Proctor represented the Aluminium Corporation, Ltd., and Mr. E. W. Hudson the Electricity Commissioners and other Government Departments.

Mr. RALPH FREEMAN, a partner in the firm of Sir Douglas Fox and Partners, consulting engineers, gave evidence that the dam was constructed in two sections. The first section was built in 1907-8, by the executive engineers, Messrs. Harper Brothers, in conjunction with his firm as consulting engineers, the contractors being Messrs. Bott & Stennett, a firm which no longer existed. The work was suspended for two years, after which his own firm acted alone as consulting engineers for the completion of the dam. The break took place at the extreme end of the first section, built by the first Aluminium Corporation. The dam was built on hard blue clay containing granite boulders, overlaid by two or three feet of peat. The dam was a concrete wall, L-shaped in plan, and the break occurred on the long leg at a point where the greatest pressure was not met with, nor was it the weakest part of the dam; at this place the plans showed that the depth of the wall was 26 feet. Mr. Owen was resident engineer for his firm during the second stage of the work in 1910-11.

In reply to the Coroner, witness said that in his opinion a dam founded six or seven feet deep in the clay was a perfectly reliable structure. There must have been some latent defect. He had frequently visited the dam, which had not been structurally altered, nor had the water-level been raised. When the burst took place a section of the clay, about 60 ft. long and 12 ft. deep, was removed from under the foundations, leaving the wall intact. Measurements that he had made since the break showed that at one end the dam was carried only 1 ft. 6 in. into the clay, and at the other end 6 ft. According to the drawings the bases should have been at the same level. This year had been the driest recorded since the dam was finished, and during the summer the lake was empty; the exposure might have dried the clay sufficiently to allow of leakage under the foundations. Leakages in the face of the dam had nothing to do with the break. The dam of the small lake Coedty above Dolgarrog, which received the escaping water, could not possibly withstand the discharge of 100 million cubic feet of water from a height of hundreds of feet.

Mr. J. ROBERTS, of Bangor, who was interested in the formation of the original company, said it was known that the dam had been leaking for some time, and the concrete used in its construction was very poor. He had seen leakages there in 1923.

Mr. A. E. JONES, watchman at the lake, said he reported a leakage near the place of the breakage early in the summer, and it was satisfactorily repaired. On the night of the disaster, November 2nd, he noticed water flowing through the wall and rang up the works at Dolgarrog; he was told to hold on the line by the person who answered the telephone, as he was speaking to someone else, and before he could deliver the message the line was broken. He then telephoned to the watchman at Lake Cowlyd and asked him to inform Dolgarrog that the dam had burst.

Mr. CROSSLEY COLLY, constructional manager to the Aluminium Corporation, gave evidence regarding work done on the dam, and said there had been leakages through it, the concrete being very porous, but no leakages under the dam had been recorded. The dam was 4,600 ft. long, of which 3,300 ft. was concrete and the rest peat bank, at the shallow end. The capacity of the reservoir above the normal level of the lake was 160 million cubic feet. It was the duty of the water supervisor to inspect the whole of the hydraulic works once a week; there was a man resident at the lake who operated the sluice-gate, and kept an eye on the works. Cracks in the dam were plastered in 1921, and grouted under pressure in 1922. During the last three years repairs were carried out on both legs of the dam, the upper face being coated with concrete. There was never any sign of water going under the dam. The two telephone lines from Eigiau and Cowlyd converged near the power station, and the former was swept away by the flood; in future it would be advisable to put the lines on higher ground.

Police-constable JONES, who was formerly a stone mason, said the part of the dam left standing over the gap had since fallen in, and he observed that the concrete was not properly mixed. During the past two years he had seen the water ankle deep across the road opposite the gap, and the place was a swamp.

Mr. A. A. HARPER, of Messrs. Harper Brothers & Co., said that his firm was responsible for the construction of part of the dam. According to the last progress sheet, issued on October 9th, 1908, the plans showed that 100 ft. of concrete had been made which had never been certified, and for it his firm was not responsible. The break took place from the point where they finished. The man in charge of the work, named Wilson, was now dead.

The witness was examined by Mr. W. PROCTOR, and admitted that a contemporary plan signed by his firm's engineer showed that the place of the fracture was within the portion constructed when Harper Brothers were alone the engineers for the reservoir. His firm never completed the contracts of 1907-1908, and was not paid for the last section of the work done, which was never certified.

Mr. L. P. D. TAYLOR, the engineer referred to by the last witness, said that his headquarters were at Dolgarrog and the work at Eigiau was under the supervision of Wilson, a reliable man who was then about 65 years of age, as clerk of works, who was responsible for the mixing of the concrete. The discrepancy between the depth of the concrete wall at the place of the fracture as shown on the plans (26 ft.) and the actual depth (20 ft. 6 in.) must have been due to negligence on the part of Wilson. Harper Brothers were the executive engineers.

Mr. J. L. OWEN said that he made the survey for the original promoters, and from the time he came into the matter for Sir Douglas Fox & Partners the foundations, to his own knowledge, were of the proper depth.

Mr. E. D. HUMPHREYS, water supervisor to the Aluminium Corporation until July last, said he reported leakages in the dam near the spot where it gave way; they all came through the concrete. A weekly report was made to the head office, and any leaks were attended to.

The CORONER, summing up to the jury, said it was clear that where the dam broke the work was not properly done; the foundations were not carried deep enough. "It was a case of accident, but undoubtedly there had been gross neglect, really criminal neglect, on the part of somebody, but unfortunately they did not know at this distance of time who was responsible."

The jury returned a verdict of "Accidental death, caused by the bursting of the Eigiau dam, and on the evidence a section of the wall lacked proper foundations." They recommended that dams should be subject to Government inspection.

For the foregoing report we are indebted to the daily Press, particularly *The Times* and the *Manchester Guardian*. Particulars and illustrations of the dam were given in the ELECTRICAL REVIEW of November 13th, p. 772.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Lighting of Parliament.—On November 30th, Mr. BARNES asked the Under-Secretary of State for the Home Department, as representing the First Commissioner of Works, whether the electric lighting installation throughout the Parliamentary buildings was the most economical and up-to-date.

Mr. LOCKER-LAMPSON said that the electric lighting installation of the Houses of Parliament was not the most up-to-date, but was generally satisfactory, and was run as economically as possible. The whole building was being re-wired gradually in order to bring it up to modern standards.

P.O. Switchboards. — On December 1st, Sir W. MITCHELL-THOMSON informed Mr. DAY that the Post Office had not ordered switchboards from Germany, nor obtained a tender for them from that or any other foreign country.

The Broadcasting Committee.—On December 1st, Sir W. MITCHELL-THOMSON informed Mr. CAMPBELL that the Broadcasting Committee would decide in due course whether it should issue any interim report and whether it should recommend the publication of evidence.

The Weir Report.—On December 2nd, Mr. BALDWIN informed Mr. T. THOMSON that it was not proposed to publish the Weir report on electrical development.

Report of Smoke Abatement League.—It is interesting to note in the 6th annual report of the Smoke Abatement League (1924-5), that satisfactory arrangements have been made to hold a "Universal Smoke Abatement Exhibition" in Bingley Hall, Birmingham, in September, 1926. The League has been engaged in adding continuously to its exhibits for use in connection with Health Weeks, &c., and many designs of exhibits, other than photographs, have been prepared. Arrangements have also been made with Messrs. Ernest Benn, Ltd., to publish a small handbook dealing with domestic smoke. This will be composed of contributions by various experts, and is intended to assist householders, builders and architects in connection with the reduction or elimination of domestic smoke. A book or series of books dealing with industrial smoke and noxious fumes is contemplated, and a pamphlet dealing with the effect of smoke on health is in course of preparation, and, it is hoped, will be published early in 1926. A forty-eight page pamphlet entitled: "Smoke Abatement in Salt Lake City, Utah," has also been published by the League with the kind permission of the Salt Lake City Engineering Department. The body has in active formation a library of books, pamphlets, &c., dealing with every aspect of smoke abatement and allied subjects, and it is hoped to develop the library for loan purposes to members. There were on September 30th thirty-nine local authorities affiliated to the League, some of which have appointed members to its Council. The League is striving its utmost to carry out its aims and ideals, but is hampered by lack of means. The statement of accounts for the year in question shows a deficiency of £289, which is the result of this year's Smoke Conference at Manchester. The subscriptions received by the League amounted to £256.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Discussions at the Institution of Electrical Engineers.

I think some protest should be made against the cutting short of the I.E.E. meetings precisely at 8 o'clock, no matter whether the discussion is complete or not, and even to the extent of instructing the author that he is not to make a verbal reply.

I was delighted to note that Dr. Smith on Thursday ignored this and gave a partial reply in acknowledging the vote of thanks. It is sincerely to be trusted that this will become the usual practice.

If it is essential that the President and Council should leave promptly at 8 o'clock, would it not be possible to appoint an acting chairman in cases where it shows signs of being worth while? Some member of standing could always be found among the audience who would be willing to take on this function.

I must say that for my part I regret the old days in which it was possible to have a really free and frank discussion.

F. Creedy.

London, *December 5th*, 1925.

As an Associate Member of the Institution of Electrical Engineers who has taken a keen interest in the progress of the Institution for a number of years, I note with great regret the very bad practice which appears to be growing, of stifling discussions at ordinary meetings, and closing the meeting, no matter what stage has been reached, so as to finish before 8 p.m.

This has been very noticeable during the last year or so. I know that several members considered this custom had reached a climax at the last meeting, when after Dr. S. P. Smith had given an excellent paper on a subject of the widest possible interest and a good discussion was developing, the meeting was curtly cut short, and the apparent discourtesy done Dr. Smith of attempting to deny him the opportunity of making even the briefest reply. To the great satisfaction of many of us he ignored this unfortunate, and, maybe, quite unintentional act and made a brief reply on general lines.

It is high time, if the Institution is to succeed in maintaining the supply of valuable papers for discussion, that members who give their time to the preparing and delivery of papers should at least be given the fullest opportunity for proper discussion of their work and for making an adequate reply.

The time at present allowed reduces the whole thing to a farce.

In conclusion, may I suggest that the Member, President or otherwise, who presides at ordinary meetings should, in all cases, be prepared to continue the meeting till 9 o'clock or even later, if it is the wish of the meeting, and that the Council dinner be held on some other evening, or that a supper at a later hour be substituted. Then perhaps the restive spirit which reveals itself as 8 o'clock approaches may be countered.

In all seriousness something should be done at once to get back to the really unfettered discussions which we used to have in the past.

May I add, I make this appeal as a listener and not as a would-be speaker.

A.M.I.E.E.

Westminster, *December 5th*, 1925.

The Metering of Three-phase Power.

In reply to "A Meter Superintendent's" letter appearing in your columns, I regret to say that I am not able to give very much *useful* information concerning the error of 15 per cent. which I mentioned as having occurred in a three-phase, four-wire meter of the two-element type. This case came to my notice in an engineering works where the load consisted of induction motors and single-phase welding plant. Condensers were also installed for the improvement of power factor. A three-phase, four-wire low-pressure supply was given to the consumer, and a two-element meter with its three current transformers connected in delta was installed to meter it. The consumer had a meter of the three-element type installed to check that of the supply undertaking, and it was noticed that this meter almost always registered apparently fast. The supply undertakers re-tested their own meter in their test department, and under the usual conditions of test to which a meter of this type is subjected, it was found to be accurate.

Doubts as to the accuracy of the customer's meter then existed, and I therefore conducted tests at his works, but only to find his meter accurate also. At my suggestion, the supply undertaking then installed three single-phase check meters, and the 15 per cent. error which I quoted was the result of the readings between these three single-phase meters and the two-element polyphase meter. Tests were afterwards made by the supply undertaking to ascertain exactly the type of load at this works, but as I was not directly concerned, I regret to say that I have no actual figures of the results obtained.

I am pleased to note that your correspondent and also Mr. Malcolm agree that three separate metering elements are desirable for the correct metering of a three-phase, four-wire supply. Whether three separate single-phase meters or one three-element polyphase meter is employed it matters not, as the results in either case will be correct for *any* condition of load.

Regarding the points which are mentioned as preventing the adoption of the three-element polyphase meter, the subject of cost is, without doubt, an important one. Whilst I admit that a five-ampere, three-element meter is slightly more costly (a matter of shillings) than one having only two elements, it should be borne in mind that usually these meters are used in conjunction with current transformers, and the extra cost for a three-element meter is then very small compared with the cost of the complete equipment.

In any case, it is my opinion that this extra cost is worth while, seeing that a meter which will register accurately under all conditions of load is obtained.

The subject of errors caused by interaction between the elements is one in which I'm afraid I am not in agreement with "A Meter Superintendent." Does he just conclude that errors of this kind occur in three-element meters, or has he any figures that he can give us on the subject? My experience is that with a properly-constructed and calibrated meter errors caused by interaction are so small that they can be neglected.

I regret to note that "A Meter Superintendent" does not think I give the meter engineer the credit due to him. That is quite contrary to my wishes. There are, without doubt, many very capable meter engineers engaged in the supply undertakings in this country, and where they are allowed to exercise their capabilities very little, if any, bad metering is to be seen. No doubt "A Meter Superintendent" is one in this fortunate position, but he should remember that the position the meter superintendent is a "minus quantity" in many of the supply undertakings, and that often when a capable man is employed he is restricted in his work and not allowed to decide on the systems of metering to be used.

I shall be interested to read the results of Mr. Malcolm's suggested experiments. The subject of maximum-demand indicators I will deal with at a later date, as I feel I have already trespassed too far on your valuable space.

H. Hugh Jaques.

London, *December 5th*, 1925.

The Salaries of Combustion Engineers.

I am afraid that the letter signed "Shift Engineer," expressing astonishment at my comments on the above subject, and, presumably, your own unqualified endorsement thereof, seems only to emphasise what I wrote. I do not for an instant belittle the rank of shift engineer, having been one myself for many years, but what I wished to emphasise was that, as in the instance given by "Shift Engineer," what constitutes a fully qualified combustion engineer does not appear to be very widely understood on this side of the Atlantic.

While the only positions open for specially trained men, of whom the specialising shift engineer is usually the best type, are of the order "Shift Engineer" has for a subordinate, there will be no encouragement for men to become specialists at all.

All engineers who keep themselves abreast of the times realise that the boiler house is nowadays the place of primary importance in view of the imperative need to keep coal costs down to a minimum, and requires infinitely more constant and careful supervision to this end than any other portion of the plant. In a case like that of your correspondent, although he is nominally responsible for the boiler-house efficiency, it is the man on the spot who actually controls this, not the one whose other duties do not permit him to do so.

It is idle to argue in these times that a man can be a first-class all-round engineer and at the same time a specialist in a particularly involved branch of engineering; whichever he gives his mind to properly, the other is bound to suffer.

Chas. F. Wade.

Sheffield, *December 4th*, 1925.

I have read with interest the correspondence on the above subject appearing in your issues of November 27th and December 4th.

In the quite early stages of my power station experience, covering as it has done the control of the combustion of, I suppose, about 3¼ million tons of fuel, I was led to the inevitable conclusion that the resident engineer must, personally, give a large proportion of his time to the solution of problems pertaining to the combustion of fuel, for the very good reason that 75 per cent. to 80 per cent. of the total cost of generating electricity is due to the cost of the fuel burnt.

The efficiency of the turbine house is settled, within small limits, by the type and design of prime mover installed. It is to the boiler house with its varied problems in mind and matter that his attention must perforce be directed if he be determined to obtain true commercial efficiency. A decrease of 5 per cent. in the amount of coal consumed—quite a possibility in many stations, even in 1925—ensures a decrease of about 3¾ per cent. to 4 per cent. in the cost per kWh.

The class of grate installed, the extent to which forced and/or induced draught is available, the facilities for bunkering fuel and for disposing of ashes—in short the conditions generally—determine the classes of coal which may be burnt with hope of success. The more elastic and complete the control over the combustion chamber the wider becomes the market for fuel. A wider market tends to extract lower offers from colliery or merchant. Therefore not only must such fuel as is purchased be properly burnt, but the limitations found and the possibilities detected in the actual combustion of the many kinds of fuel purchased must be fully known or communicated to the purchaser—usually the resident engineer.

In relatively small stations I have found that the best commercial results may be obtained by each charge shift engineer undertaking the combustion work on his own shift, giving 50 per cent. to 75 per cent. of his time to it, so long as he keeps in close touch with his chief, the latter settling the thickness of fire, speed of grate, and the best draught conditions determined by trial made in closely reasoned co-operation with his three engineers on shift. Such an arrangement has the advantage of creating friendly shift rivalry provided the coal can be weighed and the *personnel* of the shift remains reasonably constant—the latter a thing of the past with the introduction of the 48 hours' week.

If, however, the station is a large one this close co-operation is not possible to the same degree in the same way. It then becomes necessary that more of the charge shift engineer's time shall be directed to the general supervision of the station as a whole, thus diverting seriously the needed constant attention to combustion details. The resident engineer in the same way finds himself drawn little by little from this important branch of his care, by wider or more immediate issues such as extension of plant, or labour troubles, threatened or actual, Hence he must engage as a right-hand man, either in the person of a chief assistant or a thoroughly sound combustion engineer, someone who can form a reliable link between himself and the boiler house. This man will, depending on the size of the plant, together with the facilities and degree of control given him, either himself direct during the day the operations of the leading stokers, setting the conditions of combustion; or, alternatively, exercise control through the medium of junior combustion engineers on shift. At the same time he will keep his chief fully informed of results, and possibilities of improvement, obtaining consent to likely improvements and carrying them out.

I am afraid no hard and fast lines can be laid down as to when in the life of a growing station the appointment of a combustion engineer becomes a paying proposition; but that a qualified combustion engineer is a very pressing need in a well-run super-power-station cannot be gainsaid. Within the limits of commercial efficiency such a man can, if he be technically proficient, patient, resourceful, of sound character and endowed with a capacity for team work, command, and will be gladly paid, a good salary.

In a power station burning 200,000 tons of coal per annum costing 10s. per ton, a saving of £1,000 a year is effected for every 1 per cent. decrease in the coal bill. But even if we assume that following the appointment of a combustion engineer such a result was obtained, the benefit derived could not be credited wholly to his endeavours. Some credit is due surely to capital for the venture made (he might turn out a "rotter") and facilities given; more is due to the customer, and more again to the loyalty and co-operation of his fellow officers and workers. A fair figure would probably be one-third or, say, £330.

Having determined roughly the salary he could offer, due regard being given to the improvement in efficiency possible, it would, in my view, be the duty of the resident engineer in the interests of true commercial efficiency—or what may be described as a fair deal by one's staff and undertaking, one's customers and one's country—to obtain the best man at the lowest figure he can. The value to be placed on the services of such a man depends, naturally, on the number of equally good men desiring the post and the number of positions vacant.

E. W. Dickinson.

London, *December 5th*, 1925.

Rural Electricity Supply.

May I contribute to your highly esteemed journal a few remarks on the above subject, which is of much interest to-day and of which I have had about 35 years' experience.

A public supply of electricity is a benefit to all, even indirectly to those who do not themselves require a supply. Therefore to charge a rental because a pole is placed upon or because wires cross over property is selfish and unneighbourly.

I have considered and treated the matter as follows:—

In asking permission to erect a pole or attach to a chimney or cross over property, it has been on the grounds that it is first a public utility, secondly an advantage to the property owner. This second reason is explained by the statement that mains will be erected in the vicinity and if the wayleave is granted a supply of electricity will be available in the future with only the small cost of the covered wire service which is part of the wiring installation, but if consent is refused the future consumer will have to pay for an extension to the property.

To avoid a "right of way" a letter was written in each case to the owner undertaking to "make good any damage and to remove the wires at any time upon receiving three months' notice to do so." This undertaking may seem a risky condition to promise, but it has been very seldom exercised, while it gives the property owner a sense of security in the event of alteration to property or change of ownership.

Many thousands of wayleaves have been granted without any payment at all, and after the district has been well covered with supply wires, generally at the backs of the houses, then in case it is necessary to remove in one case it is easy to cut out a section and feed round. If a rental is insisted on, then the rent should be debited against the supply when required—and one may rest assured that it will be required much sooner than the owner thinks.

The getting of wayleaves is a personal matter, and the district manager may leave or die or some adverse influence may create apprehension or distrust among the owners; to avoid this and for other reasons it is advisable to form what I called "District Advisory Committees."

The District Advisory Committees consisted of members nominated by the Corporation or Urban District Council and/or by the Rural District Councils, power users, domestic users, and the supply company, with the district manager; a secretary was provided by the supply company. The Committees had no executive powers, but with their local knowledge and interests were most useful in influencing troublesome wayleaves as well as in other matters.

In all cases of a continuing business, such as electricity supply is, I consider it advisable to earn only moderate profits and the paying of dividends somewhat in relation to the cost of money, especially so where the public are *giving* facilities and their interests are the interest of the business.

Before the war dividends in no case exceeded 5 per cent.; indeed, from 1905 to 1913 a steady 5 per cent. was paid, the balance between earnings and distribution being utilised for renewals and improvement of plant. Larger dividends have been paid since the war, but then the value of money has decreased.

The price to be charged for energy is another matter that requires to be in accordance with public ideas, and in this respect the District Advisory Committees were a useful medium to correlate the ideas of consumers and suppliers—a matter also relative to free wayleaves, but which I will not pursue further in this letter.

Napier Prentice.

Stowmarket, *December 4th*, 1925.

A Grumble.

May I get a small grumble off my chest suitable for the Christmas season? Like many others, I find my time so occupied that I have great difficulty in reading the technical Press. To make matters worse, the "E.R." is becoming fuller and more interesting all the time: even the advertisements clamour to be read. How is one to get the time to absorb the ever-increasing mass of knowledge?

Overtime.

December 4th, 1925.

[Our sympathies are with our correspondent; the flood of information that reaches us, both in print and in MS, in these stirring times is almost incredible, and quite beyond the power of the individual to assimilate. But though we dwell in a land overflowing with intellectual milk and honey, we are not compelled to overeat. Let us be content to select a mental diet which shall afford variety and stimulate thought, without tending either to excess or to scantiness—and leave the rest.—EDS. ELEC. REV.]

Assisted Wiring Schemes.

The full account you gave in your issue of the 27th ult. of Mr. Edgar's paper on "Assisted Wiring," which he read before the recent E.D.A. Conference, has confirmed a statement that he made which I was unable to appreciate at the time, and would anyhow have been unable to mention at the meeting, as it was contained in his reply to the discussion.

In reply to the criticism by Mr. Abbott, Mr. Edgar stated "that he did not consider that the cost per kWh should include capital charges on the generating plant, because the generating plant was already there, and there must be sufficient overload capacity, or stand-by plant, to meet all the load that would arise from these comparatively small consumers for some time to come." These capital charges, or at any rate a proportion of them, are invariably charged to the domestic consumer, but Mr. Edgar in his anxiety to attract the small domestic consumers, lets them off their share of the capital charges, and therefore presumably sells them lighting units at a cheaper rate than to other domestic consumers.

As a statutory undertaker Mr. Edgar is surely contravening the Electricity Act of 1880, which states that "no undue preference shall be given to any consumer," and his concession seems unfair to the other domestic consumers who, as Mr. Edgar indirectly admits, have financed his assisted-wiring scheme. Taking the figures given for the estimated number of consumers under this scheme by March 31st next, namely, 6,000, and allowing, say, an average maximum demand of 100 watts per consumer, we get a total maximum demand of 600 kilowatts or, say, 400 kilowatts on the station allowing for diversity. This may be insignificant in comparison with the total maximum demand of the South Shields undertaking, but it may be appreciable if the rate of connection under his scheme is maintained, and at any rate it brings nearer the time when fresh plant will have to be installed.

With the exception of this one point this scheme seems admirable, nor would it to my mind have been less successful if the proper proportion of capital charges had been added to the unit charge, though in a small undertaking, as Mr. Abbott pointed out, these capital charges are the chief item in the cost of the lighting unit.

It is to be hoped that the E.D.A. will follow up the suggestion made that it should collect and publish details of other schemes in order to help the supply industry in its ultimate aim and purpose, namely, "to sell electricity."

J. N. R. Perks.

London, *November 30th*, 1925.

Overhead Distribution.

I read with interest your article on the electric supply to Brundall, and afterwards went to have a look at the village.

While acknowledging with gratitude that the company, to avoid damage, has done what was possible by varying the lengths of the poles and by making many diversions and crossings, I cannot share your hope that compulsory powers may be obtained for the uglification of similar tree-shaded villages. My sympathies are all with the recalcitrant frontagers—and with the trees.

A money value cannot be put on æsthetic damage, but even regarding the matter from the lowest standpoint (*i.e.*, financial), I suggest that Brundall has made a mistake in allowing a pole line through the village street. The district is practically a residential suburb of Norwich, and the householders are nearly all of a good class of people who have taken some trouble to get away from the town into a pleasant country neighbourhood. Though there is no doubt of their appreciation of electricity for similar prospective owners, a system of distribution which would look ugly in the outskirts of Manchester can hardly be classed as an attraction.

The Norwich Corporation is delivering about six miles from its generating station, and the last three miles or so are through open country. It has been able to run underground all the way, so it is difficult to see how another two miles of underground distribution could have added a prohibitive percentage to the cost.

Sometimes in recent years when repassing through a village one has wondered why it looks so much nicer, and it comes rather as a shock to realise that since the last visit the Post Office trunk line which one had regarded as a permanent feature, has been put underground. It would be a great pity if, in the name of progress, supply companies should work in the opposite direction, and give us an even worse set of eye-sores to get used to.

I should not have troubled you now, if this article had not followed a long series of advertisements showing for example a charming stretch of Welsh hills or a corner of a village in Hampshire, with the only blot on the landscape "featured" as the point of the advertisement. The force of reiteration is strong, and if nobody protests we engineers will begin to imagine that a pole-line is beautiful and that those who put it up deserve well of the community.

S. E. Glendenning, M.I.E.E.

Norwich, *December 5th*, 1925.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from December 2nd. In the case of foreign applications, the names and addresses of the British representatives are also given :—

Prt (lettering and design). No. 463,438. Class 5. Copper, brass, bronze, aluminium, and German silver wires. No. 463,439. Class 8. Copper, bare or tinned bronze, and aluminium electric cables.—Cie. Générale d'Electricité, Paris. (Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

M.W.L., My-Lite The Sign (lettering and design). No. 460,329. Class 8. Electric cells and batteries (not for medical purposes).—Marsden's (Wholesale), Ltd., 47, Church Street, Preston.

Vortexion. No. 560,932. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Kirby (Wimbledon), Ltd., 72, Merton Road, S.W.19.

Primafa (lettering and design). No. 461,463. Class 8. Electric accumulators, batteries and parts thereof.—Accumulatoren-Fabrik Gesellschaft, Berlin, S.W.11. (E. Evans & Co., 27, Chancery Lane, W.C.2.)

Silver Knight (lettering and design). No. 462,905. Class 8. Apparatus for use in radio-telegraphy and telephony.—R. H. Eliot, 100, Victoria Street, S.W.1.

Superdyne. No. 462,682. All goods in Class 8.—C. G. Williams, trading as the British Radio Manufacturing Co., 9, South Castle Street, Liverpool.

Em-Pe-A-Adyne. No. 463,343. Class 8. Instruments and apparatus and parts thereof for use in radio-telegraphy and telephony.—The M.P.A., Ltd., 82, Conduit Street, W.1.

Omarvella. No. 463,527. Class 8. Radio-telephonic apparatus and parts, &c.—G. G. Stevens, 6, Storey Road, Walthamstow, E.17.

Xcel, All British (lettering and design). No. 459,114. Class 13. Electric kettles, cooking utensils, domestic irons, electric heating and soldering irons, and electrical fittings for use in connection therewith.—Automatic Telephone Manufacturing Co., Ltd.

Decko. No. 462,430. Class 13. Electric switches, fusible cut outs, sparking plugs, and similar electrical fittings, but not including electric lamps and torches.—A. F. Bulgin, trading as A. F. Bulgin & Co., 9-11, Cursitor Street, Chancery Lane, W.C.2.

New Swedish-Danish Power Cable.—The Nordsjaellands Elektricitets og Sporvejsselskab (North Sealand Electricity and Tramway Co.) has, since 1914, received its electric current from the waterfalls at Lagen, near Halland, Sweden, by means of a 25,000-V line laid under the Sound. This company has recently, in co-operation with the Swedish Sydsvenska Kraftaktiebolag, of Malmo, the Frederiksberg Commune, and the Copenhagen Commune, laid a 50,000-V cable from Sweden to Denmark at a cost of approximately 2,000,000 crowns. This cable, which is said to operate at the highest pressure of any submarine cable in the world, has three conductors each of 95 sq. mm. cross section. The weight of the cable is 38 kg. per metre.—*Commerce Reports.*

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

11,543. "Means for the interpolation of cable code or other signals." Creed & Co., Ltd., and H. F. Woodman. May 9th, 1924. (242,535.)

16,720. "Illuminating appliances." W. A. Dorey. July 11th, 1924 (Patent of addition not granted.) (242,686.)

17,103. "Electrolytic rectifiers for alternate currents." R. F. Bossini. July 17th, 1924. (242,688.)

18,826. "Construction of electrical switch." A. E. Burrow and A. G. L. Prahm. August 7th, 1924. (242,693.)

18,881. "Picture transmission systems." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). August 8th, 1924. (242,694.)

19,026. "Electro-magnetic bells." A. E. Alexander (Signal Engineering and Manufacturing Co.). August 11th, 1924. (242,698.)

19,027. "Electro-magnetic bells." A. E. Alexander (Signal Engineering and Manufacturing Co.). August 11th, 1924. (242,699.)

19,028. "Electromagnetic bells." Signal Engineering and Manufacturing Co. August 22nd, 1923. (220,940.)

19,048. "Induction electricity meters." S. Z. De Ferranti and Ferranti, Ltd. August 11th, 1924. (242,702.)

19,107. "Control switches for varying the resistance of a circuit." F. B. Cox. August 12th, 1924. (242,705.)

19,279. "Electric relays." A. Reyrolle & Co., Ltd., and B. H. Leeson and R. C. Minton. August 14th, 1924. (242,710.)

19,375. "Automatic telephone systems." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd), and A. M. Searle. August 15th, 1924. (242,713.)

19,391. "Control of polyphase electromotors." Smith, Major & Stevens, Ltd., and P. H. Stevens. August 15th, 1924. (242,714.)

19,410. "Regulating or control systems for dynamo-electric machines." T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd. August 15th, 1924. (242,715.)

19,665. "Thermostatic relays." Igranic Electric Co., Ltd., and C. F. Tubbs. August 19th, 1924. (242,726.)

20,246. "Crystal detectors for wireless reception." A. F. H. Morant. August 27th, 1924. (242,729.)

20,338. "Electric switches." Brookhirst Switchgear, Ltd., and J. A Hirst. August 28th, 1924. (Addition to 223,960.) (242,730.)

21,585. "Telephone receivers." J. W. Dungey. September 12th, 1924. (242,737.)

22,760. "Electrical condensers." British L. M. Ericsson Manufacturing Co., Ltd., W. D. Norbury and F. Bates. September 26th, 1924. (242,742.)

22,866. "Supporting frame for electric lines." Compagnie Electro-Mécanique. November 5th, 1923. (224,506.)

24,176. "Electric supply meters." W. H. Brown. October 11th, 1924. (242,750.)

24,548. "Apparatus for converting electric currents." W. Meacher. September 6th, 1924. (Divided application on 17,749/24.) (242,753.)

24,871. "Method for separating the set from the aerial in wireless receiving and transmitting sets." W. Rawsthorne. October 20th, 1924. (242,759.)

24,915. "Wireless receiving apparatus." H. F. Abraham. October 20th, 1924. (242,761.)

25,538. "Electron discharge devices." British Thomson-Houston Co., Ltd. November 13th, 1923. (224,877.)

25,575. "Electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (242,768.)

26,949. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. November 11th, 1924. (242,785.)

26,985. "Electric incandescent lamps." A. S. Cachemaille (Westinghouse Lamp Co.). November 12th, 1924. (242,787.)

30,588. "Electric rheostats." Crompton & Co., Ltd., and W. F. Jones. December 19th, 1924. (242,807.)

31,016. "Manufacture of cables." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). December 24th, 1924. (242,814.)

1925.

388. "Selecting switches for use in telephone systems." Siemens and Halske Akt.-Ges. and F. Doring. January 6th, 1925. (242,819.)

5,624. "Telephone receivers." G. Green. March 2nd, 1925. (242,847.)

5,742. "Electric luminous discharge tubes." General Electric Co., Ltd. August 22nd, 1924. (238,845.)

7,592. "Means for influencing the power factors of alternating-current mains." Siemens-Schuckertwerke Ges. April 10th, 1924. (232,193.)

8,620. "Electric conductors." O. Sattelberg. March 31st, 1924. (231,534.)

9,179. "Emergency braking systems for electric vehicles." Maschinenfabrik Oerlikon. April 5th, 1924. (231,905.)

9,510. "Protective arrangement for alternating-current electric machines." Siemens-Schuckertwerke Ges. April 12th, 1924. (232,243.)

9,710. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. April 14th, 1924. (232,258.)

10,079. "Electric resistance elements, and methods of making same." British Thomson-Houston Co., Ltd. April 18th, 1924. (232,624.)

11,878. "Anti-dazzle devices for the headlights of mechanically-propelled vehicles." J. A. Spencer. July 30th, 1925. (242,884.)

12,495. "Means for tuning aerials and oscillatory circuits coupled with an aerial." Telefunken Ges. für Drahtlose Telegraphie. May 14th, 1924. (234,113.)

13,783. "Receivers employing the heterodyne principle." Marconi's Wireless Telegraph Co., Ltd. May 27th, 1924. (234,816.)

14,193. "Protective arrangements for alternating electric current circuits." International General Electric Co., Inc. May 31st, 1924. (Addition to 230,501.) (234,842.)

14,474. "Selective relay for the protection of electric lines." International General Electric Co., Inc. June 3rd, 1924. (235,197.)

15,016. "Process for avoiding inadmissible tension conditions in switched-off circuit portions of alternating-current electric supply systems." Siemens-Schuckertwerke Ges. June 18th, 1924. (235,869.)

15,842. "Variable electric condensers." Soc. Anon. Des Anciens Etablissements E. Picard. October 4th, 1924. (240,792.)

16,207. "Electric cables." A. H. Roberts. June 23rd, 1925. (242,911.)

16,775. "X-ray tubes comprising an incandescent cathode." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 21st, 1925. (242,915.)

17,527. "Supports for brushes of dynamo-electric and like machines." British Thomson-Houston Co., Ltd. July 11th, 1924. (236,945.)

19,454. "Protective arrangements for electric installations." International General Electric Co., Inc. October 6th, 1924. (240,798.)

23,804. "Device for indicating and determining the position and extent of sparking and other disturbances in transformers, choke coils, and other electrical apparatus operating in an insulating medium." M. Buchholz. March 24th, 1925. (Addition to 198,936. Divided application on 7,933/25.) (242,926.)

24,041. "Transmission of wave energy for high-frequency signalling." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). August 27th, 1924. (Divided application on 20,238/24.) (242,928.)

24,247. "Dimmers for headlights." J. R. Naylor and A. E. Armstrong. September 29th, 1925. (242,929.)

24,544. "Carriers and terminals for electric lamps." Soc. Anon. Des Anciens Etablissements Siegel & Stockman Réunis. March 2nd, 1925. (242,930.)

24,763. "Lifting magnets." International General Electric Co., Inc. October 3rd, 1924. (240,869.)